

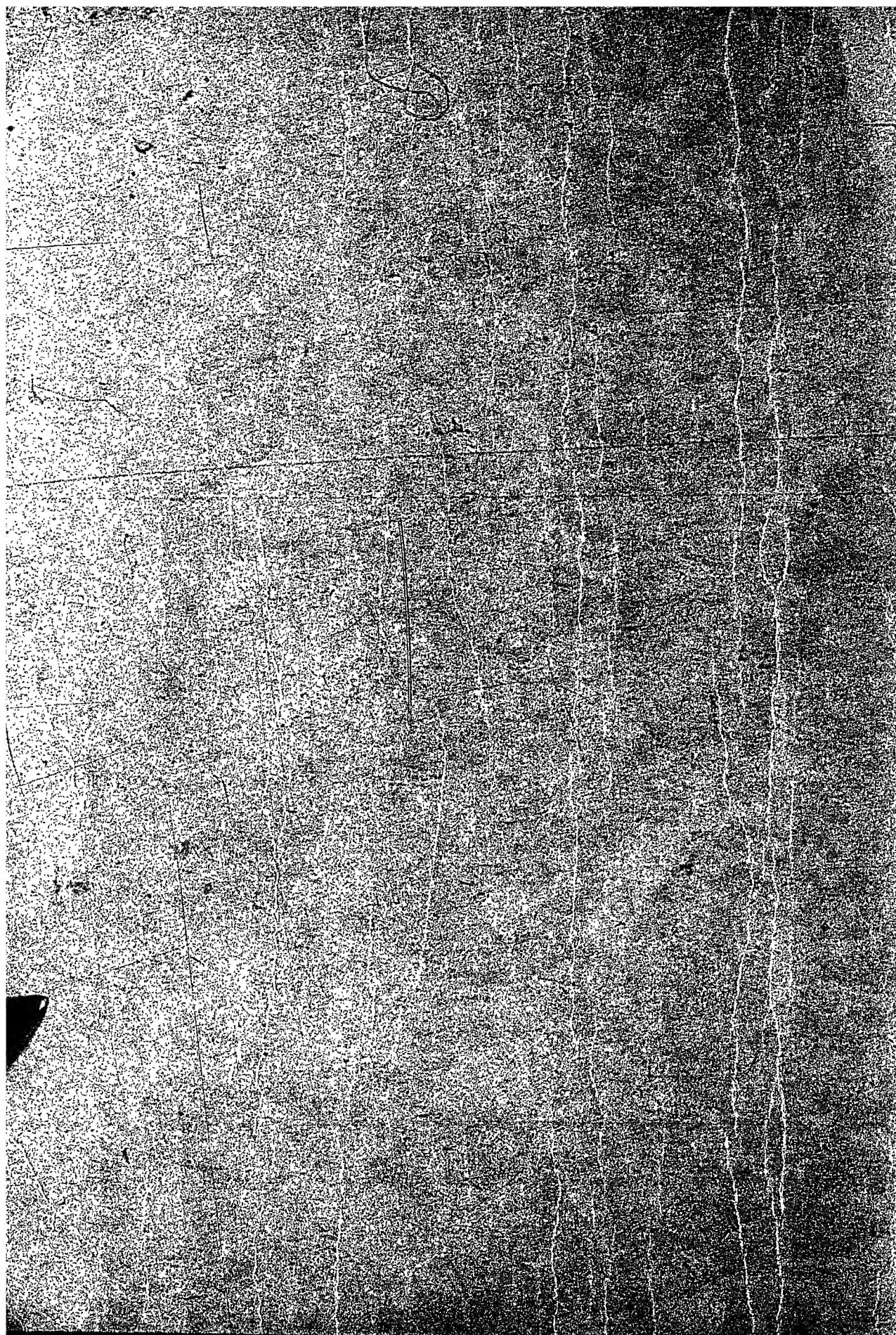
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# The HISTORY of Alberta OIL



*By* F. K. BEACH  
*and* J. L. IRWIN

*Issued by* THE DEPARTMENT OF LANDS AND MINES  
*Published by* THE PUBLICITY AND TRAVEL BUREAU  
EDMONTON, ALBERTA



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## PREFACE

The intention of this booklet is that a review of Alberta's oil industry, from many of its angles, shall be presented, but that the information contained herein shall be general rather than technical.

Many technical memoirs, which are available for public distribution and which cover in detail the subject of Alberta's oil reserves and their development, have been published at different times by the Geological Survey of Canada, the Scientific and Industrial Research Council of Alberta and by various technical societies.

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# THE HISTORY OF ALBERTA OIL

By

F. K. BEACH\* and J. L. IRWIN†

## CHAPTER I.

### The History of Alberta's Oil and Gas Development

The first page covering the history of Alberta's oil and natural gas development was written over a century and a half ago, when the early explorers of that far-away period made observations regarding the noticeable petroleum seepages which occurred along river banks of the Northwest Territories.

#### EARLY REPORTS.

A more definite introduction took place in 1878. In this year, George M. Dawson, Director of the Dominion Government Geological Survey, whose reports, preserved in the archives of Ottawa, are still consulted, was the first to make technical reference to the oil occurrences of this province, particularly to those of the Athabaska district.

Later Dr. Bell, of the same department, reported on the bituminous sands of northern Alberta, which he thought to have been caused by an up-welling of petroleum, perhaps unparalleled anywhere in the world. In his opinion the sands were at least five million years old and had been subjected to a constant soaking of oil from seepages below, otherwise they would have dried out and become dead many years ago.

Following this date and up to the turn of the century the search for oil and gas in Alberta was limited to isolated tests. Equipment, however, was inadequate and lacked many of the essentials necessary to deep well drilling.

#### GAS IN MEDICINE HAT AREA.

The results of these tests were not encouraging and the only discovery of note was that of natural gas, made in 1885 at Langevin—now known as Alderson—about forty miles north-west of Medicine Hat.

Five years later—in 1890—the first productive gas well was drilled at Medicine Hat by the Canadian Pacific Railway. The recovery was made at a depth of 650 feet with a pressure of 250 pounds obtained.

Nearly half a century has elapsed since that time during which the growing population, together with many factories, centred at Medicine Hat and the adjoining town of Redcliff, have been able to utilize this valuable natural product.

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A TURNER VALLEY CRUDE OIL WELL COMING INTO PRODUCTION

## ATHABASKA LANDING.

The first well to be drilled at Athabaska Landing was in 1894 and a gas flow was encountered. The well was abandoned in the autumn of 1895 at a depth of 1,335 feet due to a fishing operation proving unsuccessful. In the summer of 1896 the tools were moved from the well and the drilling outfit was taken down the Athabaska River, where another well was started at Pelican Rapids.

## PELICAN RAPIDS.

A strong flow of gas was encountered in this new location at 800 feet which prevented water being lowered to the bottom and the gas blew for years. The well eventually caught fire and after burning for several years was finally extinguished.

A second attempt by private enterprise was made in 1904 at Pelican Rapids in northern Alberta. Three wells in all were drilled and an oil and gas belt was located.

At the time this discovery was made the nearest railway was at Edmonton, over 300 miles away. The transfer of heavy machinery by teaming and scows over the hazardous rapids of the Athabaska River represented a pioneer feat well worthy of mention in Alberta's history.

## BOW ISLAND.

The Bow Island gas field followed Medicine Hat as a centre of gas production. Operations in this area bore sufficiently encouraging results to warrant the building of a pipe-line to Calgary and Lethbridge, the construction of which took place in 1912. Further details covering this field as given in the next chapter under the heading of "PRODUCING AREAS—NATURAL GAS."

EARLY DRILLING IN THE VICINITY OF PINCHER CREEK,  
AND WATERTON, SOUTHERN ALBERTA.

Publication of the 1938 Schedule of Wells has elicited considerable information from a variety of sources. The earliest drilling in the Province of Alberta for oil and gas goes back farther than was previously known, and there are few references available giving first hand accounts. The Department is therefore greatly indebted to Lt.-Col. F. M. Steel, D.S.O., M.E.I.C., who has made available a report in which he summarized operations in Waterton-Pinch Creek area to about 1920. Col. Steel was in practice at Pincher Creek from about 1905 until the Great War, and for a time after the war, and he not only visited the sites of all the wells, but surveyed the locations of a number of them. Access has been given, through courtesy of Mr. B. L. Thorne, M.E.I.C., to a report dated April 15, 1905, by the late Mr. William Pearce and prepared after a personal visit made for the purpose of finding out the truth after a maze of conflicting but highly optimistic newspaper reports. Dr. D. B. Dowling in G.S.C. 1920, briefly summarizes early drilling in Waterton and "Pine Creek" areas and makes references to reports by Dr. Selwyn in 1891 and by some subsequent writers. Mr. F. G. Clapp in his "Petroleum and Natural Gas Resources of Canada," reports the results of some of his enquiries.



TURNER VALLEY TOWNSITE — CENTRE OF THE VALLEY

In 1884 a Mr. Baring, of Messrs. Baring Brothers, bankers, London, England, made some investigations and established a location for a well in sec. 21, tp. 3, rge. 29, west of the 4th meridian. Drilling did not start until 1891, and a Mr. Fernie, for whom the City of Fernie, B.C., was named, appears to have been a principal mover in the development, which was undertaken under the corporate name "Southern Alberta Land Development Company Limited." After drilling to a depth of 190 feet artesian water flow caused abandonment of the hole.

After the first attempt at drilling by the Southern Alberta Land Development Company in 1891 it appears that a couple of years elapsed before another well was started in sec. 25, tp. 1, rge. 30, west of the 4th meridian, not far from Waterton Lake but due to difficulties in drilling through gravel and boulders it was abandoned.

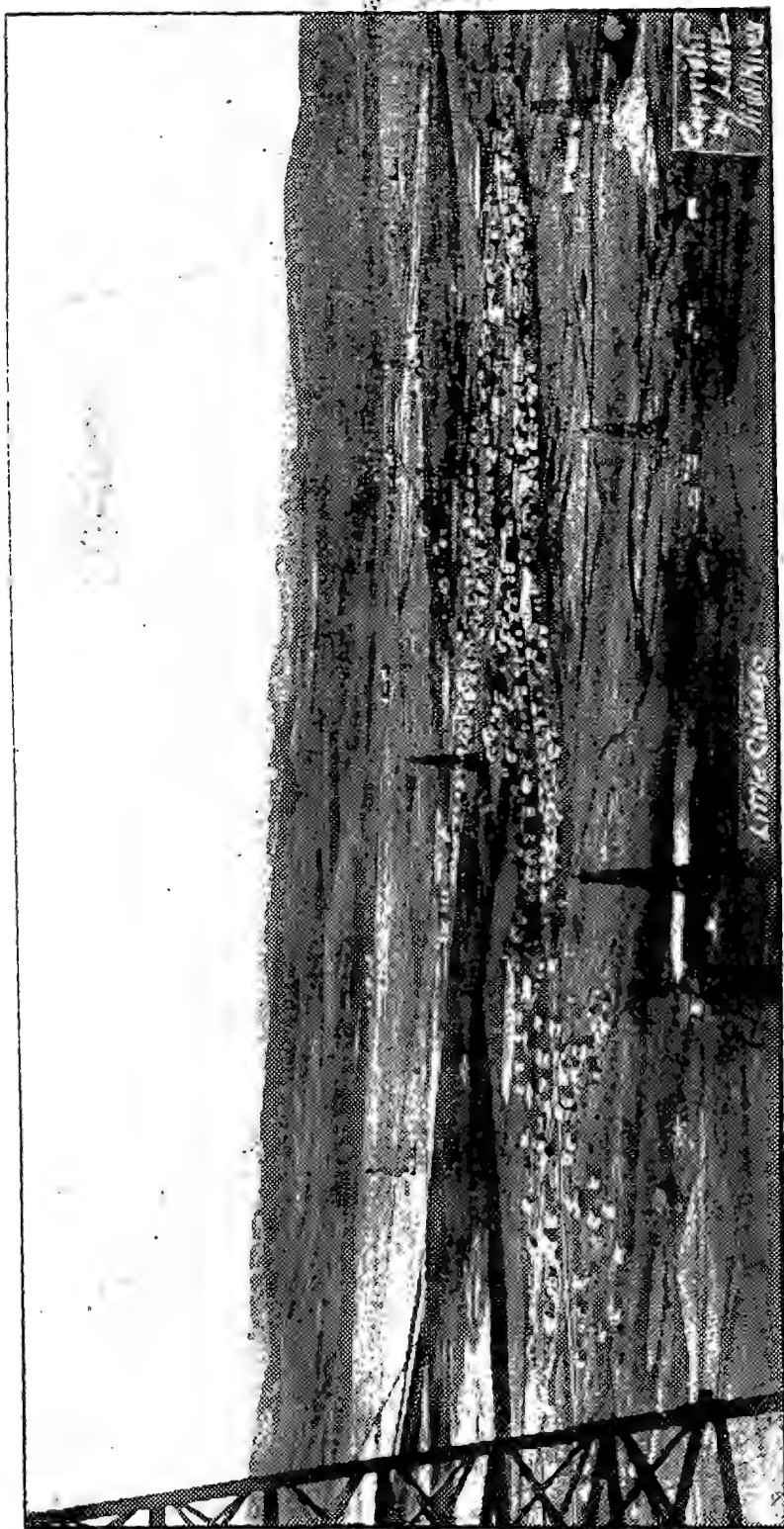
Oil seepages on Cameron brook (at an early date known as Oil Creek or Petroleum Creek) were known for some time by Indians who reported them to an early white settler, Mr. John George (Kootenai) Brown. In 1886 Mr. Brown collected some crude oil and used it for greasing farm machinery. Later, Mr. William Aldridge, a Mormon employed by Mr. Brown, dug trenches and pits into which oil seeped and was collected, being sold to ranchers in the vicinity at a dollar a gallon.

Mr. John Lineham of Okotoks organized the Rocky Mountain Developing Company in 1901 and operations were commenced in the late autumn of that year in N.E.  $\frac{1}{4}$  sec. 30, tp. 1, rge. 30, west of the 4th meridian and at a depth of 1,020 feet oil was encountered, the date of discovery being reported as Sept. 21st, 1902. Some reports said the well flowed and others that the oil rose some distance in the hole. Claims were made that the well would produce 300 barrels a day, but good evidence exists that up to June, 1903, the well had not been pumped, although an analysis of the oil had been obtained. Mr. Clapp reports an analysis by Dr. Ellis, Professor of Chemistry, Toronto University, and another by Mr. Arthur D. Little of Boston, as follows:

Boiling Range.	Ellis		Little
	Gravity.	Per cent.	Per cent.
Below 150°C. ....	52°	5.7	5.1
150°-300°C. ....	41°	56.3	41.0
Over 300°C. ....	33°	35.6	41.1
Residue, tar and coke (by weight) .....		2.16	9.7

Drilling with cable tools cut the pipe, allowing gravel to run in. Tools were stuck in the hole after striking oil, and steam pressure in the boiler was insufficient to pull them out. The boiler was old and the driller tied down the safety valve in an effort to get enough pressure to pull the tools, with the result that the boiler burst. Later efforts resulted only in cleaning out cavings from above the bit and stem, which could not be recovered. In October, 1904, Mr. Lineham had a pump installed. On starting the pump, water was lifted for two hours, after which oil was pumped. Mr. Lineham filled a barrel which he took to Pincher Creek for shipment, and brought back to the well a supply of galvanized iron and a tinsmith to have three 50-barrel tanks built.

In November, 1904, a Mr. J. W. Warren visited the site and reported in the press that the oil was 34° Beaume and "a large quantity"



LITTLE CHICAGO, A TOWNSITE IN SOUTHERN TURNER VALLEY

was being pumped; that the oil was free from sulphur, and that oil seepages could be seen at various points down the creek. Mr. Warren's report was reprinted in various newspapers at the time, together with statements that the well was good for 300 barrels a day. The next spring, (1905) Mr. William Pearce visited the site and found three tanks full of oil, each holding "upwards of 2,000 gallons," and a small "refinery," made from a section of ten-inch well tubing built in a temporary fire archway, and operated by "Professor" Jules K. Rickets (probably Rickert).

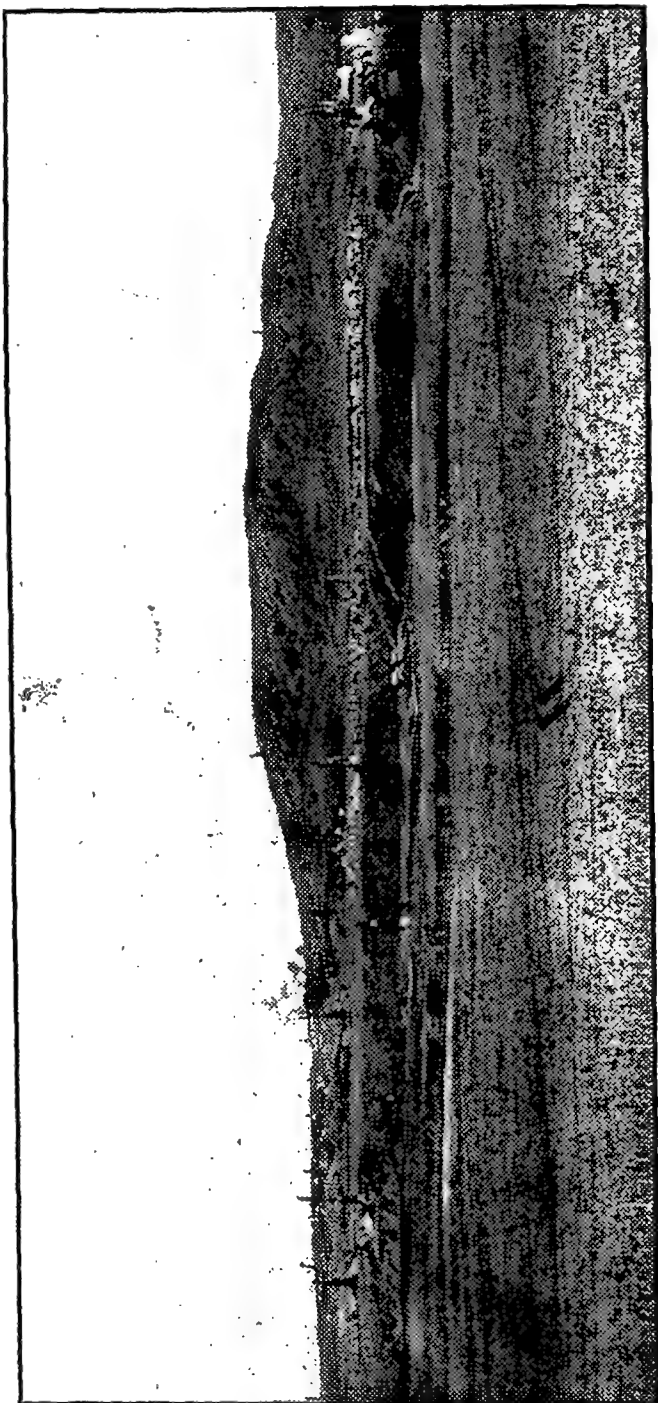
In September, 1905, highly coloured reports were printed of a spectacular strike of a gusher of 8,000 barrels a day, but Mr. Lineham denied the truth of this story and attributed it to a stock-selling campaign. It is well established, however, that this company in 1903 after striking oil in the first well, purchased a new rig, much heavier than the first and which was to cost \$10,000 and used it in drilling several more holes. Hole No. 2, about a mile down the creek from No. 1, was drilled to 500 feet and abandoned. No. 3 was a quarter of a mile up the creek from No. 1, and it had reached a depth of 420 feet at the time of Mr. Pearce's visit and later that year drilled to 1,460 feet, obtaining only a showing of oil.

A Vancouver syndicate was formed and started drilling. It was later organized as the Western Oil Company and still later reorganized as Western Oil and Coal Company. Mr. Pearce describes their No. 1 location as a quarter of a mile down the creek from Lineham No. 1. This hole, started in 1902, was carried to 1,485 feet, obtaining a little gas at 300 feet, and no oil, they appear to have believed that a fault intervenes between Lineham No. 1 and their well. Western No. 2 was located 200 feet east of Western No. 1, was drilled to 285 feet and abandoned as a dry hole, apparently in 1902. Col. Steel records No. 3 and No. 4 as located in sec. 23, tp. 1, rge. 30, west of the 4th meridian, near the west shore of Waterton Lake, neither of them getting through the surface gravels, and No. 5 reaching 1,984 feet. This appears to be the hole described by Mr. Pearce as having reached 700 feet when he visited the place.

Col. Steel states that this well started in Pre-Cambrian or Cambrian and at 1,530 feet passed into Cretaceous, identified by Daly as Benton shale. Col. Steel describes the well as being located near Cameron Falls, while Mr. Pearce mentions it as located near the mouth of Pass Creek (Blakiston Brook). It is assumed that Mr. Pearce's visit was hurried and he mistook one creek for the other. Some showings of oil were encountered in the Benton near the bottom, and Mr. G. F. Stafford, the driller, who lived in Pincher Creek, told Mr. Clapp that the well should have been an 18 or 20 barrel producer, but tools were lost and the hole caved.

Pincher Creek Oil Company, organized about 1905, put down several holes, the deepest of which was 198 feet, along a small tributary of Cameron Brook in the hope that oil from seepages would collect in the holes. Reorganized as Pincher Creek Oil and Refining Company, Ltd., they put down another hole to about 700 feet.

In October, 1907, the Western Oil and Coal Company procured the services of Dr. I. C. White, State Geologist of West Virginia, and as a result of his advice, discontinued further drilling at Waterton and started a well close to Pincher Creek in 8 of 27, 6-30, w.4. The



LITTLE NEW YORK, ANOTHER TURNER VALLEY TOWNSITE, A MILE AND A HALF SOUTH OF LITTLE CHICAGO

hole was carried to a depth of 1,800 feet without obtaining any production. This well probably started in Willow Creek shale.

In 1907-08 The Canadian Northwest Oil Company drilled in sec 8, 4-3, w. 5, to a depth of 1,706', reporting a showing of thick black oil at 1,242'. A second hole at this location was drilled in 1909-10, to a depth of 3,000', the new company being known as Canada West Oil Co. A diamond drill was used and the cores were eventually brought to Calgary to the office of the supervisory mining engineer. Owing to lapse of time, markings of depth had disappeared from the core boxes, but a cursory examination by Mr. J. G. Spratt indicated that the formations penetrated were sediments of either early Palaeozoic or Pre-Cambrian age.

The locations of Twin Butte (Northwest Co.) No. 1 and No. 2 are shown in Dowling report (G.S.C. 1920, 15B) as: No. 1, in 16 of 14, 4-30, w. 4. No. 2, in 4 of 21, 3-30, w. 4.

The early work done by the Lineham interests earned a grant of petroleum and natural gas rights in fee simple and in 1914, Original Discovery Oil Company was organized to develop these holdings, and put down a diamond drill hole to a depth of 1,294 feet. Without obtaining oil other than small seepages at 910-930', the hole was abandoned in 1920. Oil City Royalties, drilling close to the same site in 1932 to 1936, reached 2,500' without obtaining production.

#### INTRODUCTION OF NATURAL GAS SUPPLIES TO CALGARY AND LETHBRIDGE.

Mines Branch Publication No. 291, by Mr. F. G. Clapp, published in 1915, reports:—

"Two wells have been drilled within the city limits of Calgary, one of which was discontinued at a depth of 3,414'. . . . The other well was drilled within the city limits about twenty years ago, and only reached a depth of 1,426'."

Mr. P. Turner Bone, M.E.I.C., states that the latter well was located near the intersection of 4th Street East and 7th Avenue. Records of the Canadian Western Natural Gas, Light, Heat and Power Company show that the former well is in the S.E.  $\frac{1}{4}$  sec. 12, tp. 24, rge. 1, west of the 5th meridian, south 1,662 feet and about 44 feet east from the centre of the section, or by description from the subdivision into blocks, from the south-east corner of block 42, plan 6700 AN., producing the block outline south-easterly 463 feet, thence at right angles easterly a distance of 408 feet. The well is near the residence of the late Col. James Walker and Mr. W. J. S. Walker and still (1939) supplies a little gas for Mr. Walker's use.

Mr. Clapp mentions another well in the Sarcee Indian Reserve, and the late Mr. W. S. Herron gave its location as south of S.E.  $\frac{1}{4}$  sec. 2, tp. 24, rge. 3, west of the 5th meridian, near Lott Creek.

The Department is indebted to Mr. B. L. Thorne, M.E.I.C., for some added information respecting dates of drilling and results obtained, and also to the Gas Company records for dates of connection of various sources of gas supply.

The Calgary Natural Gas Company was organized in 1905 by the late Mr. A. W. Dingman, and was incorporated under the Com-

panies Ordinance of the Northwest Territories, the stock being largely subscribed to by business men of Calgary.

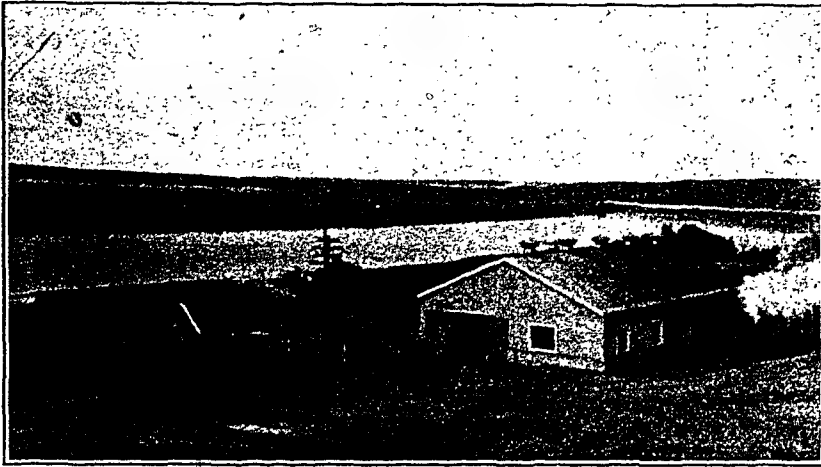
A first well was located under the advice of the late Dr. D. B. Dowling of the Geological Survey of Canada, the location being as above stated in the Sarcee Indian Reserve. It would appear that drilling started in 1906 and by September, 1907, had reached a depth of 2,805 feet. The final depth of 3,400 feet was apparently reached in February, 1908 when it was abandoned. Some gas showings were recorded at 300 feet, 2,000 feet and 2,800 feet, but were not large enough for exploitation. In realizing the advances made in quality of tools which has occurred in the intervening years, the drilling of this well to that depth was quite an achievement. All casing from this well was recovered and used in drilling the second well on the Walker Estate.

The Walker well appears to have been started about August, 1908, and the driller was a Mr. W. Elder, later associated with Mr. W. S. Herron in the Herron Elder Company, a forerunner of Okalta Oils, Limited. In September, 1908, gas was encountered at about 800 feet in sufficient quantity to supply fuel for the boiler and was estimated at the time as 150 Mcf. per day. In May, 1909, at a depth of about 2,800 or 2,900 feet, another flow of gas was encountered, estimated at the time at 1,000 Mcf. per day. A depth of 3,125 feet was reached in September, 1909 and Mr. Wyatt Malcolm, in G.S.C.-29-E, records a driller's log to 3,414 feet. Mr. Malcolm prints the driller's log of the well and places the bottom of the Edmonton series at about 1,953 feet and top of Belly River series at about 2,454 feet. According to present nomenclature, the intervening formation is called Bearpaw and consists of marine and brackish water shales and sandstones with occasional traces of coal and plant remains. A study of the driller's log as published by Mr. Malcolm has been made by Mr. D. P. Goodall of the Petroleum and Natural Gas Conservation Board, who suggests that under present views the Bearpaw is likely to have been limited between the depths of 2,360 and 2,560 feet.

The pipe was laid from the well to the Calgary Brewing and Malting Company's premises where gas was first used on April 11th, 1910. The mains were later extended for domestic, fuel and street lighting in East Calgary.

At an early date the Calgary Gas Company (not to be confused with the Calgary Natural Gas Company), erected a plant on 10th Avenue, between 4th and 5th Streets West, for the manufacture of artificial gas and some twenty-six miles of mains were laid and had connections for about 1,800 consumers. Many of these mains were connected under streets which by 1910 had been paved. Manufactured gas was sold at \$1.35 to \$1.50 per Mcf., as against an initial rate of 25c per Mcf. for natural gas.

In June, 1910, Mr. Eugene Coste organized the Prairie Fuel Gas Company and later in the year carried on negotiations leading to amalgamation with the Calgary Natural Gas Company and the Calgary Gas Company, and took over wells drilled by the C.P.R. at Bow Island, Brooks, Bassano and Dunmore. Plans were laid for drilling more wells at Bow Island where the prospects seemed best for a supply of gas.



BOW ISLAND REPRESSING PLANT

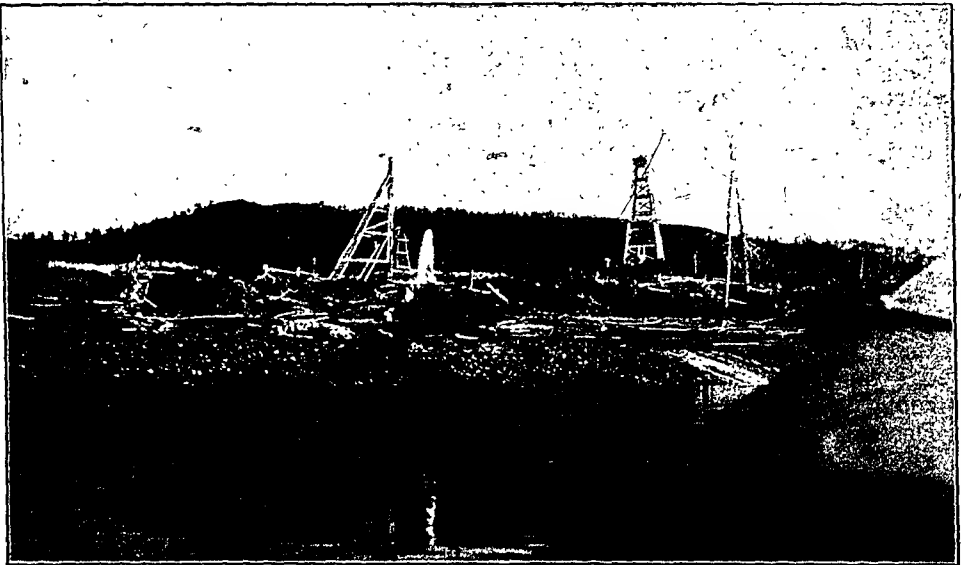
The first Bow Island well after completion had an open flow of 8,000 Mcf. per day and a closed pressure of 750 pounds after blowing for a month, and then being closed in for a short time. The pressure built up to 800 pounds, when closed for three weeks. Taken in comparison with other available sources, the field seemed to have the best prospects for sustained supply of any developed up to that time. Several more wells were drilled and the information obtained in drilling them seemed adequate proof of a field suitable for a supply for Calgary.

In August, 1911, the Prairie Fuel Gas Company was succeeded by the Canadian Western Natural Gas, Light, Heat and Power Company, Limited, and in 1912, a 16-inch line was laid from Bow Island to Calgary. The route finally chosen went fairly close to Lethbridge and Macleod and to all the towns between Macleod and Calgary, eventually supplying them all. Gas from Bow Island was turned into the line to Calgary in the fall of 1912. By 1920, the field showed edge water intrusion and pressures had fallen so low that other sources of gas had to be sought.

In the meantime, Mr. A. W. Dingman in 1914 had incorporated Calgary Petroleum Products, of which he became Managing Director. Three wells were drilled, and oil discoveries in 1914 precipitated an oil boom. The oil in the three wells of this company was accompanied by considerable gas, and was so volatile that experiments were made in recovery of natural gasoline from the natural gas, followed by construction of a small absorption plant. A fire on October 20th, 1920 burned this plant and the need of its replacement precipitated the need of refinancing the Company. On December 24th, 1920, shareholders ratified arrangements for refinancing and early in 1921 a new organization known as the Royalite Oil Company, took over the assets of the Calgary Petroleum Products, rebuilt the absorption plant and started further drilling. In the fall of 1921, a combination 6 and 8-inch pipe line was laid from the absorption plant to Okotoks, where it fed the transmission line to Calgary, gas being turned into the line on December 31st, 1921 after passing through the absorption plant and compressors.

In 1923, the Gas Company started drilling in the vicinity of Foremost, developing a supply of gas which was piped in 1924 nearly 30 miles to feed the Calgary transmission line. Even with these additional sources, the available gas was scarcely sufficient for cold weather demands in Calgary. Drilling near Barnwell between 1919 and 1923 discovered some gas, but not in quantities adequate to meet the need. It was not until the completion of Royalite No. 4 in October, 1924, that the great reservoir in the limestone of Turner Valley was tapped. A scrubbing plant was built by the Royalite Oil Company, which in 1921 had contracted with the Gas Company to supply them with gas, and a 10-inch pipe line was laid directly from Turner Valley to Calgary. Both of these operations were conducted in 1924 and gas from Royalite No. 4 was turned into the system in December of that year. Later it was found that the facilities afforded by the line to Okotoks and the one direct to Calgary were inadequate to care for peak demands, and a 14-inch line from Turner Valley to De Winton was built in 1928, connecting at that point with the 16-inch main.

During subsequent years much gas was being produced in Turner Valley incidental to recovery of naphtha present in the reservoir in vapour phase. In order to conserve some of the gas which would otherwise be lost, the 16-inch line to Bow Island was utilized. Compressors were installed at a suitable point adjacent to that field, wells were repaired for the purpose of injection and others were plugged. Repressuring started in August, 1930, continuing with minor interruptions until the end of January, 1939, during which time some 13,000,000 Mcf. was injected into the Bow Island field, and the pressure was raised from about 250 to 565 pounds.



Oil exploration in the Peace River country some 15 years ago. A little oil was discovered in the area, but water intrusions hampered operations.

## WAR AND POST-WAR PERIODS.

The final section of this chapter is reserved for a brief history of Turner Valley's oil and gas development, which dates from 1912, and which has been continued since that time in varying and spectacular stages up to the present day.

During the war the only other discovery of particular note, outside of the important introduction of Turner Valley's first productive wells, was the proving of a commercial dry gas field at Viking, some 80 miles south-east of Edmonton. From this field the gas requirements of Edmonton and towns in proximity of the pipe-lines have been supplied ever since. Gas was also discovered in the district lying to the north of Kinsella and immediately east of the Viking field.

Oil exploration in fields outside of Turner Valley was continued after the war in widely scattered areas, such as Peace River, Wainwright and near to the international border. At a later date test wells were drilled in many other sections of the province in the areas as designated on the map accompanying this review.

## TURNER VALLEY DEVELOPMENT.

The story of Turner Valley and its development is, up to the present, the real story of Alberta oil. It is the story of Canada's oil as well, for, as a result of all that has developed over the last twenty-five years in this small section of southern Alberta, Canada in 1939 took, for the first time in her history, a definite second place amongst the oil producing countries of the British Empire.

In the period of 1912-14 this now famous field made its first spectacular appearance. Two wells, drilled there by the Calgary Petroleum Products, Limited, and known at that time as the Dingman wells, were brought into production in shallow horizons above the limestone.

The oil discovered was not very great in quantity, but the idea so inflamed the imagination of Calgary people, who had gone through a frantic real estate boom, that oil was hailed as a successor in which quick and easy money could be made. Real estate offices were converted to brokers' offices overnight and a host of companies were organized. Citizens crowded and stood in line to buy stocks, and in places clothes baskets were pressed into service as cash receptacles.

In looking back upon that period now it would be most unfair to criticize the wildness of the enthusiasm which materialized. It was the province's first real promise of recognition as a centre of oil production on a major scale.

It should be pointed out, perhaps, that very few of the promoters at that time had the vaguest notion about how much it would cost to drill a well. In addition to this there was very little trained geological talent available to guide them in selecting drilling sites, and technically trained men to look after expenditures were also lacking. Any man who had training as a driller, however slight the training might be, could demand extravagant wages and be regarded with respect.

The boom of 1914 did not last and it might no doubt be stated that the outbreak of war was not the sole cause for its collapse.

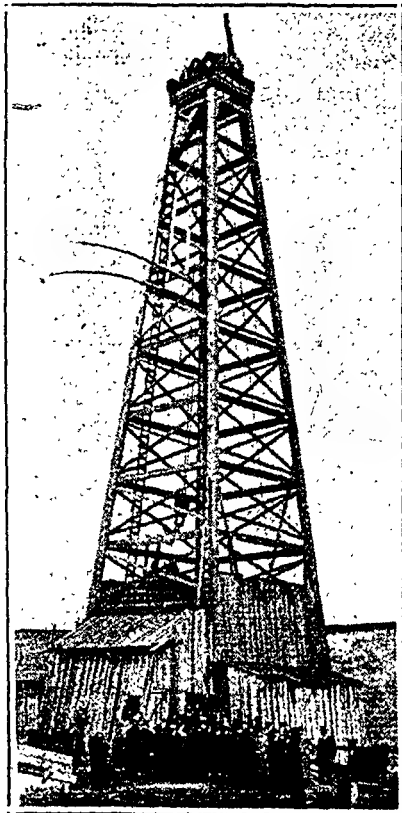
Due to over-investment in many projects, which had little chance of success, it was difficult later on for companies with real prospects to attract the needed capital.

The Board of Public Utility Commissioners came into being in 1915 and perhaps it may be said that the unrestrained and short-lived Turner Valley boom of the previous year or two was one of the reasons for its formation.

"The Sale of Shares Act" followed, which supervised the sale of such securities on an orderly basis and gave protection to the investing public. With the passing of years "The Securities Act" has now taken the place of this original legislation, an act subscribed to by the provinces of Canada as an improved and more protective measure under which the disposal of such securities is now carried out.

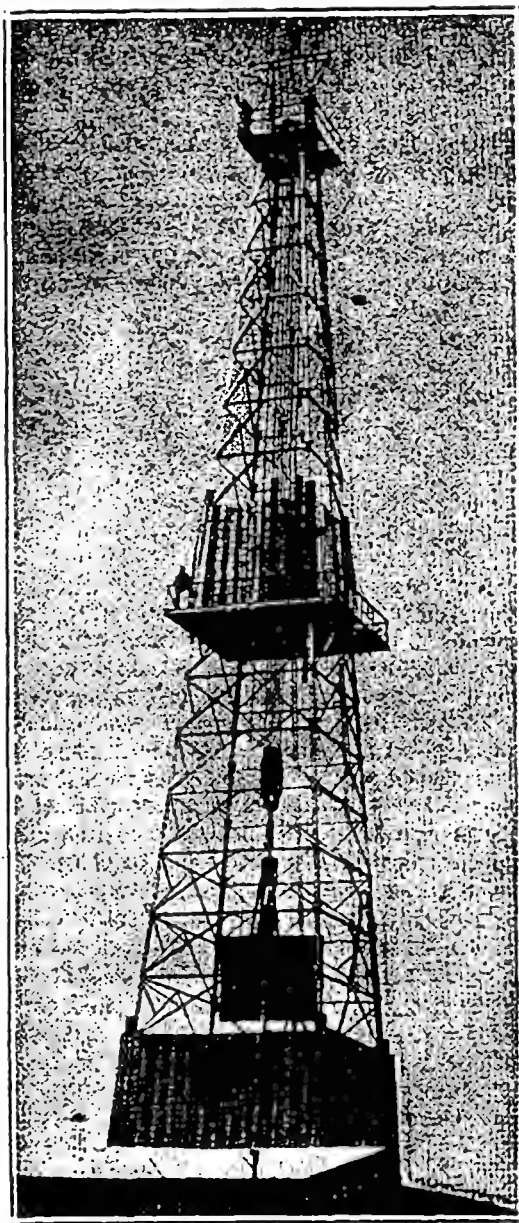
Several of the companies in this first Turner Valley boom drilled wells and obtained modest yields of oil. Small topping plants were built and gasoline was marketed from them, and the development which they carried on was in some cases accepted on reorganization of companies, so that original investors did not lose everything.

In the drilling programmes which arose, the practice of saving samples of formations penetrated for technical geological examination



It is interesting to compare these two pictures. On the left is the wooden derrick of the old Dingman Discovery Well — a type in use 25 years ago.

On the right is the full steel derrick of the modern rotary, over 150 feet in height, now in general use in Turner Valley.



tion did not, with the exception of a few companies, immediately arise." For this reason, wells that failed to get oil production also failed to benefit the industry as a whole in attaining knowledge of sub-surface conditions. One bright newspaper man, untrained as a geologist, recognized this failing and he took the trouble to examine and record some well logs. He was able to distinguish sandstone from shale and to record the general appearance of samples of drill cuttings.

With the collapse of the boom, coupled with the fact that Canada was at war, the first dramatic introduction of Turner Valley faded from the public mind leaving few, if any, to visualize the possibility of the field's tremendous reserves — a potentiality, which in later years was to be so vividly realised.

In view of all that has happened since, that first period of 1912-14 must stand always as a prominent milestone in the Valley's history, representing as it does the introduction and discovery of the field. It must stand also in order that a lasting tribute may be paid to those early pioneers who, by their courage, faith and hard cash, and without the benefits of present-day engineering facilities, made that introduction possible.

After nearly ten years had passed from the 1914 boom, with dultory activity in drilling and minor returns in the way of oil production, the Calgary Petroleum Products, now reorganized as Royalite Oil Company, drilled a fourth well. In doing so the stage was immediately if unconsciously set for the erection of Turner Valley's second spectacular milestone.

Royalite 4 penetrated the lower cretaceous sands in which the other wells had obtained some production, without getting more than shows of oil. It went through dense black Fernie shales in which there was no porous reservoir rock, and found Palaeozoic limestone beneath. The hopes of most men in the industry fell, for in other parts of the province the limestone had been sterile of oil, though sometimes yielding water. Drilling was continued, however, into the lime, even though hope was failing. About sixty feet below the top of this lime a little foul smelling gas was encountered, but it gave no sign of commercial values. At last, having penetrated 250 feet of lime without yield, 260, 280, it was decided to abandon the test. Then another 10 feet of hole was made and at 290 feet in the lime a burst of gas came.

Tools were pulled out and the valve closed on top of the well. A pressure gauge showed a rise of pressure of about 100 pounds a minute. After a few minutes the crew retired to a little distance and at the end of 15 minutes the casing started to rise and went to the crown of the derrick, later settling back as gas came up around.

The well caught fire and was not extinguished for several weeks. Tests showed that there was oil in the gas, and it was thought possible the oil might be removed in a separator. It took some time to import a separator and get it rigged up. Although the big flow of gas was struck on October 17th, 1924, it was not until nearly the end of the year that the separator was actually working and oil being put into tanks. Then it was found that the well was making around 500 barrels a day. Roads to Okotoks were only of earth, without gravel to make them passable in wet weather and to dispose of this production meant much horse-drawn transport. However, on reaching railhead at Okotoks, this highly volatile "naphtha," as it was called, brought a price of about \$4.40 a barrel. Just what it cost for hauling from the well to Okotoks is not known.

There was much uncertainty as to whether this phenomenal money-maker—which during its many years of production yielded a total of over 900,000 barrels of "naphtha," valued at over \$3,000,000—was a freak which would not be repeated, or whether it marked a field which could be exploited. Taking the uncertainties of transpor-

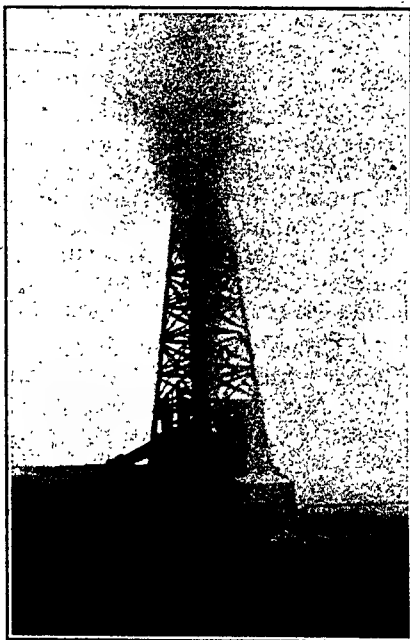
tation cost, lack of pipe-line, and the question as to whether other wells would prove good producers, there was a considerable lag between completion of Royalite 4 and the financing of new drilling.

When the commercial value of the new well became apparent, there was another minor boom. Old stock certificates were resurrected and traded, and new issues were sold. However, the succeeding wells completed were all of much smaller size than Royalite 4, and public interest once more flagged. Many promoters, fearing the productive area might be insignificant, drilled on leases as small as ten acres. One company actually started three wells and projected a fourth on one ten-acre lease.

The experiment of trying to close Royalite 4 had been disastrous. Later it was discovered that two strings of casing had parted about 1,000 feet below the surface, probably from other causes than high pressure, but while precautions were taken in later wells to cement the casings and to tie the valves down, no operator was willing to risk closing the wells against the unknown pressure, and the gas was allowed to pass through separators at maximum restraint of somewhere around 300 or 400 pounds back pressure. Under such conditions of close drilling and unrestrained operation, it is little wonder that many wells soon gave so small a yield in the separator as to make operation unprofitable, and the loss of gas from the reservoir per barrel of oil recovered became staggering.

The third milestone in Turner Valley's history came early in 1929 when the Home 1 well came in as a prolific producer, yielding around 700 barrels per day. Home 2 and 3, completed later in the year, were also large wells, and these completions sustained interest and provided funds both directly from production and indirectly from encouragement to subscription of new money, to finance a drilling campaign that continued long after the stock market collapse of late 1929 which ushered in the "depression" and stagnation in capital expenditure which attained world-wide proportions.

All of the big wells in and adjoining the Home property in sec. 20, 19-2 w. 5, showed extremely rapid decline, and some wells in this area never had large yield. By this time — in fact, from 1927 — samples of drill cuttings were systematically saved and examined. Examination of samples from this area suggested that the high yields came from fracture zones, since the porosity and presumably the permeability in this area were low. The rapid decline in production in this area was a blow to development, which proceeded very cautiously for several years.



Successively lower yields of naphtha in the separator, as reservoir pressures fell, both in total recovery per well and in recovery per unit quantity of gas produced led to the belief that a large percentage of the liquids in the gas was being lost. In 1933 a plant was built by Royalite for recovery of natural gasoline from gas which had already passed the separators. This plant was highly remunerative from the start, and it was apparent that material values had been lost for some time through failure to process the gas. Other absorption plants were constructed and most of the gas produced was so processed.

Meanwhile, in many wells which once yielded a water white product, a coloured product began to be recovered in the separators. In several wells the product contained even wax, and the liquid yield per unit of gas produced was high enough to suggest that a liquid phase reservoir had been tapped.

This condition led to the financing of a well on the west flank which had been shut down for lack of funds. Turner Valley Royalties No. 1 well was thus completed on June 16th, 1936, at a depth of 6,828' — much deeper than any previous wells, and it yielded prolific quantities of oil with only a small gas flow.

This proved to be the fourth great milestone in Turner Valley's history. June 16th, 1936, must stand out always as a red letter day in the Valley for it is the date on which the Turner Valley Royalties well made the discovery of crude oil in encouraging quantities in the limestone on the western flank of the structure. It is the day also on which the intensive development of the Valley really started — a development which after 3½ years' extreme activity gave to Alberta in 1939 a yearly production total of 7,594,411 barrels.

Successive completions in this deeper zone on the west flank of the gas cap confirmed the discovery of a major pool. By September, 1937, there was so much oil being produced that existing pipe-lines from Turner Valley to Calgary were inadequate to carry the product, and it was a problem to market the gasoline when refined.

The major purchasers of oil found themselves forced to prorate their purchases, using as a basis only the previous month's purchases. As new wells were completed, that measuring stick was of no value. It became evident from rising gas/oil ratios that some wells were being produced at rates which would soon ruin them and which would result in terribly small ultimate recoveries as compared with what might be expected if production was restricted and carried out on the basis of orderly development.

Under these conditions the operators agreed on a Conservation Board which should have a staff large enough to observe the essential facts and assign to each well the allowable production to be taken from it. The Board did not content itself with occasional observations, but kept a continuous service, issuing new proration orders from time to time as conditions changed. Thus, if the allowable for any well had been set higher than it should have been, falling bottom hole pressure and rising gas/oil ratios would cut its next allowable, and vice versa. The orders of the Board have for these reasons been accepted by operators in the knowledge that in the long run each well will receive its fair share of allowable production, that reservoir

energy will not be unduly wasted, that the price structure will be maintained, and ultimate return per well will be materially increased.

No doubt the rate of yield of the field could be increased above the present figure. In the meantime, each operation is kept on a rational basis, and in particular, the ultimate yield will be enhanced by the longer period which will be created by restriction of rate of production.

The price of oil at the well has fluctuated to some extent with supplies available. During the period when "naphtha" or "natural gasoline" were the predominant products, it was chiefly of value for blending with gasoline imported or refined from imported stocks, and at times the proportions needed for blending meant that much of it had to be shipped to distant markets. Of course some of the "naphtha" was used as a motor fuel without blending and with or without "sweetening" to remove the objectionable odour. It worked very well in some motors, but in general was too highly volatile for use alone.

Prices were first posted by the major purchasers on February 11th, 1931, when it was stated that the former price of \$3.69 per barrel for naphtha and \$3.10 for crude of 50° would be replaced by \$3.19 for clear naphtha, \$2.95 for discoloured naphtha, \$2.71 for crude of 50° or over, \$2.12 for crude 45° to 50°.

The successive prices are tabulated as follows:—

Date	Clear	Discoloured Naphtha	40°	Crude 45°	50°	64°
	\$3.69	-----	-----	-----	\$3.10	-----
11th February, 1931	3.19	\$2.95	-----	\$2.12	2.71	-----
14th March, 1931	2.74	2.50	-----	1.87	2.36	-----
24th August, 1931	3.12	2.88	-----	2.08	2.65	-----
22nd April, 1932	3.32	3.08	\$1.56	2.18	2.80	-----
24th January, 1933	2.82	2.58	1.41	1.90	2.41	-----
20th July, 1933	2.99	2.75	1.46	1.99	2.54	-----
26th August, 1933	3.16	2.92	1.51	2.08	2.67	-----
11th September, 1933	3.50	3.26	1.61	2.26	2.93	-----
9th December, 1933	3.15	2.91	1.50	2.07	2.66	-----
7th March, 1934	2.87	2.63	1.50	2.07	2.44	-----
21st May, 1934	2.55	2.31	1.50	2.07	2.19	-----
3rd February, 1936	2.70	2.46	1.55	2.12	2.32	-----
				Absorption gasoline		
3rd February, 1936					\$2.28	

With completion of a large crude well a price was posted by one company on 9th December, 1936, of \$1.73 for 46° crude retroactive to August 1st. This was followed by another company on 17th December, 1936, of \$1.55 for 40°, increasing .03c with each degree in gravity to 64.9°, at \$2.27.

65° and over discoloured	\$2.36
65° and over clear	2.60
Absorption gasoline	2.33

These prices held to 1st September, 1937, when a new price list started at \$1.36 for 40°, increasing .02c per degree to 64.9° at \$1.84; 65° or more \$2.36, whether clear or discoloured; 20-pound (Reid vapour pressure) natural gasoline \$2.16, 17-pound (R. V. P.) \$2.30.

The next change of 1st June, 1938, starts with \$1.14 for 40°, increasing .02c per degree to \$1.62 for 64.9°, and \$2.14 for 65° and over. 20-pound (R. V. P.) at \$1.94; 17-pound, \$2.08.

This price still holds except that since 1st July, 1939, all well production of 64° and over is valued at \$1.62.

#### PRESENT AND FUTURE

The above brief history of Turner Valley's development finishes with the close of 1939 and illustrates the four important periods of that history which stand out so prominently over twenty-five years of time. It endeavours to illustrate also the great difficulties with which the industry was confronted in its pioneer period, the benefits secured as experience was gained and the advantages acquired by the improved engineering facilities which come at a later date.

As previously stated, the story of Canada's oil development belongs so far to Alberta, and the story of Alberta's development in this respect to Turner Valley. What the future oil story of this Province is to be no one of course can say. Another major field — or fields — may materialize. It is expected that they will. In the meantime, Turner Valley will carry on and will no doubt expand, confident that it may for many years draw upon its great reserves. With respect to its past history, it is admitted that mistakes may have occurred — in so new a field and under the pioneering conditions of the past they were almost bound to occur. With development, however, as carried out during the last few years the Valley's industry should feel that there is no need for an apology.

Footage drilled and oil production secured during past years reflect the development already described and tables covering both of these together with other statistical information are given as follows:

#### FEET OF HOLE DRILLED

YEAR	Turner Valley	Foothills West of T.V.	Rest of Alberta	TOTAL
Prior to 1927 .....	115,391	38,969	493,272	647,630
1927 .....	53,340	6,898	24,728	84,996
1928 .....	111,160	2,930	53,450	167,540
1929 .....	240,020	49,997	80,580	370,597
1930 .....	123,583	22,616	83,136	229,334
1931 .....	61,939	4,244	50,369	116,552
1932 .....	13,096	845	18,680	32,621
1933 .....	51,806	1,743	18,300	71,849
1934 .....	78,278	4,093	13,853	96,221
1935 .....	27,462	7,242	25,769	60,473
1936 .....	52,470	8,208	37,937	98,615
1937 .....	245,531	8,851	37,572	291,959
1938 .....	303,112	8,968	51,212	363,292
1939 .....	281,274	25,891	67,122	374,287

**SUMMARY OF OIL PRODUCTION IN ALBERTA**  
Quantities in barrels of 85 Imperial Gallons

YEAR	Oil Wells	Gas Wells	TURNER-VALLEY Limestone	Natural Gasoline	Shallow Crude	RED COULEE Light Crude	WAIN- WRIGHT Heavy Crude	MISC. Heavy Mostly Crude	TOTAL
1914-21					56,599				56,599
1922				9,294a	6,559				15,853
1923				8,060	1,943				10,003
1924				13,205	844				14,049
1925				8,951	2,926				168,643
1926			156,766	7,283	2,609		5,981		219,598
1927			208,725	5,854	38,808		2,526	529	332,133
1928			284,416		70,734		7,952	222	489,531
1929			410,623		72,480		12,332	4,271	999,152
1930	62,539		1,251,500		50,545		9,739	5,604	1,433,844
1931	85,256		1,260,431		26,936		7,142	10,362	1,455,195
1932	60,494		798,622		21,694		6,935		917,622
1933	55,213		711,891	185,781	23,822		5,276		1,013,040
1934	78,624		717,818	414,324	21,896		11,779	510	1,265,940
1935	124,893		586,747	496,681	18,691		14,638	1,564	1,263,750
1936	319,845		351,914	602,360	13,119		14,957	310	1,320,442
1937	1,916,110		188,353	657,169	10,589		13,559	2,338	2,796,908
1938	6,029,010		121,439	531,434	9,192		12,985	24,161	6,742,039
1939	7,180,161		70,650	296,787	8,431		11,624	13,736	7,594,411
TOTAL	15,912,147	8,013,636	3,237,183		458,417	286,337	137,425	63,607	28,108,752

NOTE.—The division between oil wells and gas wells in Turner Valley limestone is only approximate.

a. From 1922 to 1927, natural gasoline was derived from horizons above the limestone; from 1933 onward, from the limestone.

b. Includes some light crude from miscellaneous localities.

In addition to the foregoing general production statement, another one is given covering the last 4 years in detail as to months, and shows increases and decreases for the previous 2 years. It appears as follows:—

### ALBERTA OIL PRODUCTION

(Quantities in Barrels)

Month	1936	1937	1938	1939	Comparisons, 1938 and 1939
January.....	105,171	127,977	444,196	515,539	71,343 Increase
February.....	96,077	140,515	401,587	340,107	61,480 Decrease
March.....	101,857	161,832	467,732	366,898	100,834 Decrease
April.....	94,230	172,608	447,241	543,489	96,248 Increase
May.....	98,789	175,997	546,719	690,066	143,347 Increase
June.....	97,639	191,634	521,895	798,170	276,275 Increase
July.....	122,771	226,000	678,243	877,005	198,762 Increase
August.....	124,287	271,898	799,023	767,984	31,039 Decrease
September.....	120,210	281,154	867,939	701,209	166,730 Decrease
October.....	120,638	325,723	667,454	796,147	128,693 Increase
November.....	113,794	326,677	427,236	712,179	284,943 Increase
December.....	124,979	394,893	472,774	485,618	12,844 Increase
<b>TOTAL.....</b>	<b>1,320,442</b>	<b>2,796,908</b>	<b>6,742,039</b>	<b>7,594,411</b>	<b>852,372 Increase</b>

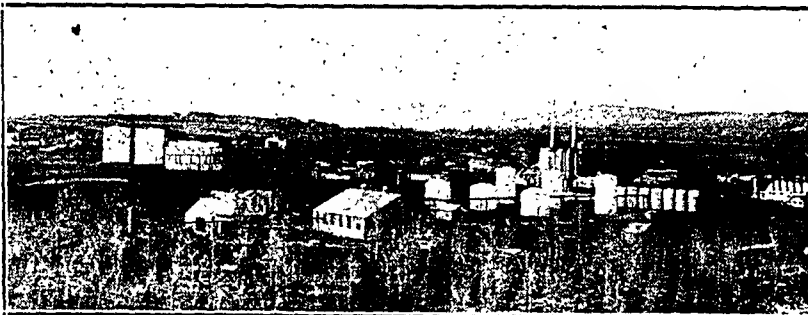
Increase 1937 over 1936 .....1,476,466 barrels

Increase 1938 over 1937 .....3,945,131 barrels

Increase 1939 over 1938 ..... 852,372 barrels

The following is a statement which gives production totals of individual Turner Valley oil wells for December, 1939, for the year, 1939, and total production of each well since it was brought in to the end of 1939.

The statement is continued to show production totals over the same periods for Turner Valley gas wells (separators), absorption plants and crude oil from other Alberta fields, displaying grand totals at the end of the table.



## ALBERTA OIL PRODUCTION

COMPANY—		Total to		
Turner Valley Limestone Oil Wells		December	1939	end of 1939.
Anglo-Canadian 1	_____	6,561	89,205	105,080
Anglo-Canadian 3	_____	11,987	147,208	147,208
Anglo-Canadian 4	_____	7,250	54,899	54,899
Anglo-Canadian 5	_____	7,626	50,958	50,958
Anglo-Canadian 6	_____	15,145	64,911	64,911
Anglo-Canadian 8	_____	1,174	6,393	6,398
Anglo-Canadian Associated Companies:				
Argus 1	_____	1,693	3,176	3,176
Coronation 1	_____	5,668	111,277	188,874
Extension 1	_____	7,569	162,294	162,294
Extension 2	_____	7,075	59,980	59,980
Firestone 1	_____	1,812	53,079	188,686
Foundation 1	_____	1,533	38,957	229,988
Frontier 1	_____	6,178	160,504	397,648
Monarch 1	_____	2,855	49,088	210,153
Prairie 1	_____	4,009	130,438	434,585
Spy Hill 1	_____	948	18,385	43,107
Sundance 1	_____	5,318	155,362	334,006
Westflank 1	_____	2,517	35,139	86,643
Westflank 2	_____	1,492	44,336	133,265
Westflank 3	_____	1,306	33,439	93,425
Barsac 1	_____	3,613	66,055	133,132
British Colonial 1	_____	7,249	65,678	65,678
Brown 1	_____	3,207	82,228	330,043
Brown 2	_____	3,021	102,480	276,195
Brown 4	_____	77,347	77,347	176,483
Brown 5	_____	54,615	54,615	76,450
Brown Associated Companies:				
B. and B. 1	_____	1,757	33,326	327,103
Four Star 1	_____	3,041	66,783	199,655
Intercity 1	_____	2,549	45,403	48,528
Royal Crest 1	_____	3,052	51,218	161,705
Three Point 1	_____	1,379	26,450	88,087
Turner Valley Royalties 1	_____	2,353	51,122	548,378
United 5	_____	4,319	107,718	194,505
Vulcan-Brown 1	_____	8,238	186,250	371,499
Westside 1	_____	2,748	38,655	197,696
Calwin 1	_____	3,159	19,064	19,064
Command 1	_____	5,740	112,935	122,663
Commoil 1	_____	4,285	145,593	501,650
Commoil 2	_____	4,226	113,804	170,389
Consolidated 1	_____	7,238	188,997	171,691
D. and D. 1	_____	4,386	67,110	67,110
Davies 1	_____	4,951	92,893	184,661
Davies 2	_____	3,923	84,775	491,069
Davies 4	_____	5,268	109,969	133,869
East Crest 4	_____	1,052	16,906	16,906
Globe 1	_____	4,055	59,714	106,768
Granville 1	_____	2,567	39,774	112,205
Harris 1	_____	3,957	43,442	43,442
Harris 2	_____	5,154	74,503	74,503
Home-Millarville 2	_____	12,582	221,082	221,082
Mercury Royalties 1	_____	1,748	43,080	80,535
Model 1	_____	3,257	36,801	492,398
Model 2	_____	627	6,004	47,885
Model-Spooner-Reward 2	_____	1,654	78,145	209,907
National 1	_____	2,101	45,754	251,006
National 2	_____	4,081	58,683	104,414
Northwest-Hudson's Bay 1	_____	6,550	141,878	141,878
Northwest-Hudson's Bay 2	_____	5,115	5,115	5,115
Oil Ventures 1	_____	5,011	59,295	59,295
Okalta 7	_____	5,726	5,726	5,726
Okalta 8	_____	6,292	80,377	80,377

## ALBERTA OIL PRODUCTION—Continued.

COMPANY—	December	1939	Total to end of 1939.
Turner Valley Limestone Oil Wells			
Pacific 1 .....	5,519	120,873	294,355
Pacific 2 .....	4,862	105,857	174,471
Pacific 3 .....	5,471	126,695	135,388
Richwell 1 .....	3,522	76,446	103,029
Royal Canadian 1 .....	4,872	100,393	257,805
Royal Canadian 2 .....	6,495	174,563	207,725
Royal Canadian 3 .....	7,309	30,410	30,410
Royalite 28 .....	3,200	61,637	137,885
Royalite 29 .....	3,789	75,065	162,713
Royalite 30 .....	7,277	162,377	281,088
Royalite 31 .....	4,182	63,615	101,387
Royalite 32 .....	4,844	84,568	141,378
Royalite 33 .....	4,928	76,730	113,758
Royalite 34 .....	3,626	39,852	46,169
Royalite 35 .....	5,464	81,492	81,492
Royalite 36 .....	9,567	163,759	163,759
Royalite 37 .....	7,119	127,409	127,409
Royalite 39 .....	7,603	62,054	62,054
Royalite 40 .....	7,058	46,281	46,281
Royalite 41 .....	6,805	59,521	59,521
Royalite 42 .....	10,221	39,284	39,284
Royalite 43 .....	9,300	9,300	9,300
Royalite 45 .....	3,208	3,208	3,208
Sterling Pacific 4 .....	3,807	72,327	539,186
Sterling Pacific 5 .....	3,987	68,554	394,329
Sterling Pacific 6 .....	5,111	71,079	303,692
Share 1 .....	2,588	35,676	132,771
Sunburst 1 .....	2,492	44,728	114,531
Sunset 1 .....	5,610	152,298	397,066
Sunset 2 .....	6,794	131,068	184,711
Winalta 1 .....	5,855	53,126	53,126
York 1 .....	6,152	148,155	224,983
York 2 .....	5,288	41,024	41,024
3 gas wells while in oil list .....		34,961	
<b>TOTALS</b> .....	<b>452,148</b>	<b>7,180,161</b>	
Gas Wells Separators .....	6,658	70,650	8,013,636
<b>ABSORPTION PLANTS:</b>			
British American .....	4,362	70,585	308,013
Gas and Oil Products .....	3,286	50,994	455,154
Royalite No. 1 .....	11,017	106,496	1,720,350
Royalite No. 2 .....	4,595	68,712	691,198
Earlier plants .....			62,468
<b>All Absorption Plants</b> .....	<b>23,260</b>	<b>296,787</b>	<b>3,237,183</b>
<b>SHALLOW CRUDE:</b>			
4 Wells (year) .....	673	8,431	458,417
<b>RED COULEE:</b>			
Vanalta (7 Wells) .....	1,102	13,022	286,337
<b>WAINWRIGHT:</b>			
5 Wells (year) .....	1,252	11,624	137,425
<b>MISCELLANEOUS:</b>			
9 Wells (year) .....	525	13,736	63,607
<b>Total Oil Production for December, 1939</b> .....	<b>485,618</b>		
<b>Total Oil Production for 1939</b> .....		<b>7,594,411</b>	
<b>Total Alberta Oil Production (1914 to 1939, inclusive)</b> .....			<b>28,108,752</b>

## LIST OF WELL COMPLETIONS.

A list of wells completed in the Turner Valley limestone from June 16th, 1936, when the Turner Valley Royalties well, first of the big crude oil producers from that formation, came into production, to December 31st, 1939, is given as follows:—

## 1936

Well	Depth	Date Started	Date Completed
Turner Valley Royalties 1 .....	6,828'	14 April, 1934	16 June, 1936
*Sterling Pacific 3 .....	6,788'	7 May, 1936	16 Nov., 1936
Foundation 1 .....	6,474'	14 June, 1934	1 Dec., 1936

Total completions from June 16th to December 31st, 1936 .....3

## 1937

Well	Depth	Date Started	Date Completed
B. & B. 1 .....	6,609'	22 Aug., 1936	2 Feb., 1937
Westside 1 .....	6,374'	9 May, 1934	2 Mar., 1937
*Newfold 1 .....	6,254'	15 Sept. 1936	5 Mar., 1937
Sterling Pacific 4 .....	7,184'	5 Aug., 1936	17 Mar., 1937
*Dalhousie 8 .....	6,911'	4 Sept., 1936	27 Mar., 1937
Monarch 1 .....	7,007'	1 Feb., 1937	19 July, 1937
Sterling Pacific 5 .....	7,073'	5 Mar., 1937	31 July, 1937
*Richland 3 .....	6,075'	1 Aug., 1933	20 Aug. 1937
Davies 2 .....	6,965'	9 Apl., 1937	7 Sept., 1937
Brown 1 .....	6,817'	1 Apl., 1937	13 Sept., 1937
*Mercury 8 .....	6,023'	4 Feb., 1937	23 Sept., 1937
Brown 2 .....	6,997'	29 Mar., 1937	25 Sept., 1937
Granville 1 .....	7,318'	16 Mar., 1937	30 Sept., 1937
Share 1 .....	7,110'	27 Mar., 1937	30 Sept., 1937
*Model-S.-Reward 1 .....	6,942'	30 Apl., 1937	1 Oct., 1937
Four Star 1 .....	7,105'	29 Apl., 1937	11 Oct., 1937
Royal Crest 1 .....	7,114'	5 Apl., 1937	20 Oct., 1937
Prairie 1 .....	7,315'	9 Mar., 1937	21 Oct., 1937
Commoil 1 .....	7,475'	28 Mar., 1937	23 Oct., 1937
Three Point 1 .....	6,963'	13 Apl., 1937	29 Oct., 1937
Firestone 1 .....	6,917'	4 Sept., 1937	2 Nov., 1937
Sterling Pacific 6 .....	7,117'	16 June, 1937	14 Nov., 1937
Westflank 1 .....	7,150'	21 May, 1937	19 Nov., 1937
National 1 .....	7,220'	9 May, 1937	6 Dec., 1937
Royal Canadian 1 .....	7,416'	23 May, 1937	11 Dec., 1937
Sunset 1 .....	7,475'	17 Apl., 1937	20 Dec., 1937
Westflank 3 .....	6,888'	6 Aug., 1937	20 Dec., 1937

Total Completions for 1937 .....27

## 1938

Well	Depth	Date Started	Date Completed
*Brown 3 .....	6,777'	19 June 1937	4 Jan., 1938
Westflank 2 .....	6,973'	5 July, 1937	15 Jan., 1938
*Richland 2 .....	6,850'	11 Mar., 1934	12 Feb., 1938
Spy Hill 1 .....	7,058'	12 July, 1937	17 Feb., 1938

1938 — *Continued.*

Well	Depth	Date Started		Date Completed	
Royalite 28 .....	6,949'	8 Oct.,	1937	20 Feb.,	1938
Royalite 29 .....	6,920'	13 June,	1929	27 Mar.,	1938
Davies 1 .....	7,373'	20 Mar.,	1937	19 Mar.,	1938
Sunburst 1 .....	7,157'	10 Apl.,	1937	24 Mar.,	1938
Brown 4 .....	6,733'	18 Oct.,	1937	9 Apl.,	1938
West Turner (Pacific 1) .....	7,274'	10 Aug.,	1937	17 Apl.,	1938
National 2 .....	7,705'	1 Apl.,	1937	24 May,	1938
Model-S.-Reward 2 .....	7,185'	8 Dec.,	1937	18 May,	1938
Sundance 1 .....	7,410'	31 Dec.,	1937	18 May,	1938
Barsac 1 .....	6,855'	24 Oct.,	1937	27 May,	1938
Royalite 30 .....	7,690'	13 Jan.,	1938	31 May,	1938
United 5 .....	7,303'	12 Dec.,	1937	6 June,	1938
Frontier 1 .....	6,915'	15 Jan.,	1938	9 June,	1938
Vulcan-Brown 1 .....	7,440'	24 Apl.,	1937	11 June,	1938
Globe 1 .....	7,400'	9 Apl.,	1937	11 June,	1938
Coronation 1 .....	7,572'	4 Jan.,	1938	27 June,	1938
West Turner (Pacific 2) .....	7,133'	19 Jan.,	1938	19 July,	1938
Mercury Royalties 1 .....	6,666'	3 Dec.,	1936	25 July,	1938
Royalite 31 .....	8,064'	5 Mar.,	1938	7 Aug.,	1938
Royalite 32 .....	7,308'	23 Mar.,	1938	12 Aug.,	1938
Commoil 2 .....	7,665'	10 Apl.,	1938	29 Aug.,	1938
Royalite 33 .....	7,676'	2 May,	1938	4 Sept.,	1938
York 1 .....	7,463'	21 Jan.,	1938	7 Sept.,	1938
Sunset 2 .....	7,527'	27 Feb.,	1938	16 Sept.,	1938
Brown 5 .....	7,146'	8 May,	1938	5 Oct.,	1938
Consolidated 1 .....	7,986'	7 Feb.,	1938	10 Oct.,	1938
Richwell 1 .....	7,132'	6 May,	1937	14 Oct.,	1938
Davies 4 .....	7,232'	13 May,	1938	19 Oct.,	1938
Royal Canadian 2 .....	7,185'	16 Mar.,	1938	23 Oct.,	1938
Okalta 6 .....	10,209'	12 July,	1937	28 Oct.,	1938
Anglo-Canadian 1 .....	8,222'	7 June,	1938	5 Nov.,	1938
Royalite 34 .....	7,500'	12 July,	1938	23 Nov.,	1938
Command 1 .....	7,908'	8 May,	1937	27 Nov.,	1938
West Turner (Pacific 3) .....	7,850'	20 Apl.,	1938	29 Nov.,	1938
Intercity 1 .....	8,045'	29 Jan.,	1938	8 Dec.,	1938

Total Completions for 1938 ..... 39

## 1939

Well	Depth	Date Started		Date Completed	
Extension 1 .....	8,020'	26 Apl.,	1938	2 Jan.,	1939
Home-Millarville 2 .....	8,495'	9 Apl.,	1938	8 Jan.,	1939
Anglo-Canadian 3 .....	7,736'	16 July,	1938	16 Jan.,	1939
D. and D. 1 .....	7,388'	23 Aug.,	1938	8 Feb.,	1939
Royalite 36 .....	7,910'	5 Sept.,	1938	8 Feb.,	1939
Royalite 37 .....	7,628'	7 Sept.,	1938	16 Feb.,	1939
Royalite 38 (N.W.H.B. 1) .....	7,494'	2 Dec.,	1938	12 Apl.,	1939
Royalite 35 .....	7,381'	13 Mar.,	1938	15 Apl.,	1939
Harris 1 .....	7,244'	11 Dec.,	1938	26 Apl.,	1939
East Crest 4 .....	8,040'	21 Mar.,	1938	9 May,	1939

## 1939 — Continued.

Well	Depth	Date Started	Date Completed
York 2	8,027'	2 Nov., 1938	24 May, 1939
Okalta 8	7,121'	18 Feb., 1938	28 May, 1939
Oil Ventures 1	7,807'	29 Dec., 1938	17 June, 1939
Harris 2	7,564'	22 Dec., 1938	19 June, 1939
British Colonial 1	8,364'	28 Apl., 1938	24 June, 1939
Anglo-Canadian 5	8,639'	27 Dec., 1938	2 July, 1939
Winalta 1	7,253'	10 Jan., 1939	10 July, 1939
Calwin 1	7,257'	2 Jan., 1939	16 July, 1939
Royalite 39	8,089'	10 Feb., 1939	23 July, 1939
Royalite 40	7,880'	3 Mar., 1939	22 July, 1939
Anglo-Canadian 4	8,303'	18 Jan., 1939	25 July, 1939
Royalite 41	7,415'	14 Apl., 1939	2 Aug., 1939
Scottish 1	9,001'	1 Oct., 1937	28 July, 1939
Extension 2	8,354'	12 Feb., 1939	21 Aug., 1939
Anglo-Canadian 6	8,334'	6 Feb., 1939	29 Aug., 1939
Royal Canadian 3	8,667'	28 Feb., 1939	2 Oct., 1939
Royalite 42	8,491'	30 Apl., 1939	5 Oct., 1939
Anglo-Canadian 8 (Scott C. & E.)	7,788'	31 Jan., 1939	19 Oct., 1939
Argus 1	7,384'	4 May, 1939	19 Oct., 1939
Okalta 7	7,425'	23 Jan., 1938	19 Nov., 1939
Northwest H.B. 2	7,591'	31 July, 1939	2 Dec., 1939
Royalite 43	8,800'	10 May, 1939	4 Dec., 1939
Royalite 45	7,486'	11 Aug., 1939	28 Dec., 1939
Command 2	8,184'	9 July, 1939	29 Dec., 1939
Royalite 46	7,994'	8 Aug., 1939	30 Dec., 1939

Total Completions for 1939 ..... 35

## RECAPITULATION

1936	3
1937	27
1938	39
1939	35
<b>TOTAL</b>	<b>104</b>

The above specified period shows 104 well completions. All of these were crude oil producers from the limestone with the following 10 exceptions, shown "\*" in above list, leaving a net total of 94 producing oil wells:—

Gas Wells	Not used.	Abandoned	Abandoned-Water
Sterling-Pacific 3	Richland 3	Dalhousie 8	Okalta 6
Newfold 1	Brown 3	Richland 2	Scottish 1
Mercury 8			
Model S.-Reward 1			

The total of 104 wells drilled shows, therefore, 94 oil wells, 4 gas wells and 6 either abandoned or not in use as at the end of 1939.

To this total of 94 wells producing crude oil from the limestone in Turner Valley should be added Model 1 and Model 2, which were brought into production prior to June 16th, 1936, and which bring the total of crude oil producers in the Valley by the close of 1939 to 96.

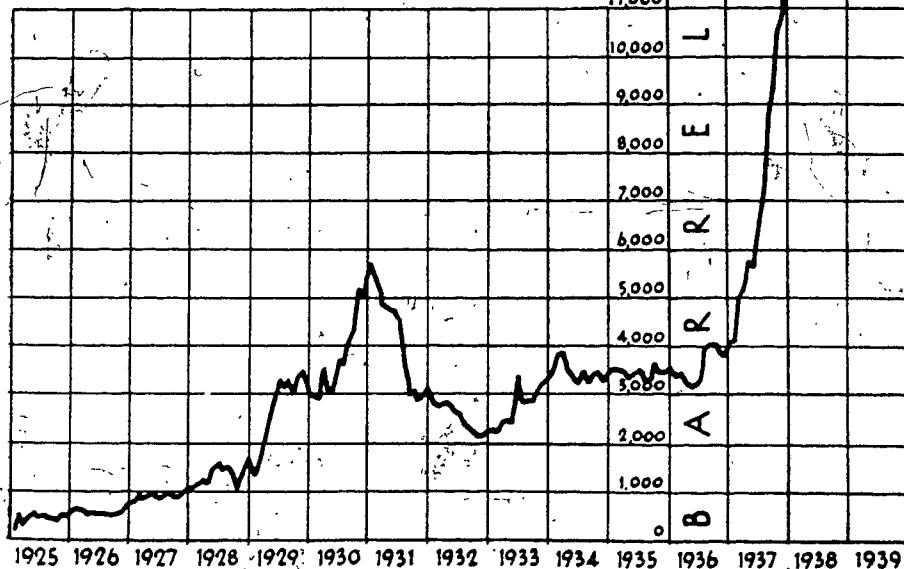
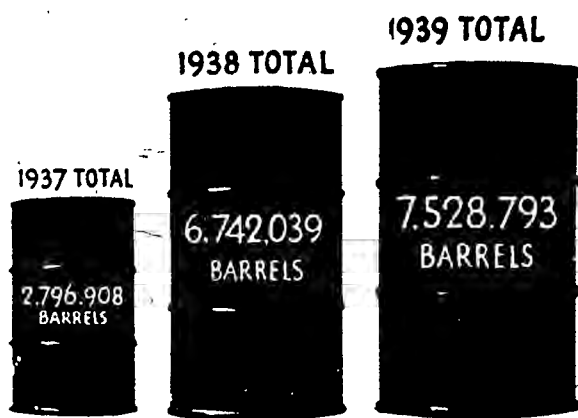
## ALBERTA'S PRODUCING OILFIELDS

FIELD	Producing Wells	Daily Average Production	Wells Drilling	Producing Depth	Gravity A.P.I.	Base	Outlet	Age of Field
<b>TURNER VALLEY:</b>								
40 miles from Calgary—								
Limestone crude	94	20,000 a.	18	6,800' to 8,600'	39 to 48 av. 43	Intermediate (wax bearing)	Canadian Prairies	3½ years
Limestone distillate	101 b.	175	nil	3,700' to 6,800'	55 to 73 av. 64	Intermediate (wax bearing)	Canadian Prairies	15 years
Limestone natural gasoline	above	815	nil	3,700' to 6,800'	73	Paraffin	Canadian Prairies	15 years
Shallow crude	3	20	nil	3,200' to 3,700'	49 to 50	Intermediate (wax bearing)	Canadian Prairies	25 years
RED COULEE—Montana Border—	7	35	nil	2,500'	30	Intermediate	Canadian Prairies	10 years
<b>WAINWRIGHT—</b>								
150 miles east of Edmonton	5	30	nil	2,200'	18 to 22	Hybrid	Local	11 years
<b>MISCELLANEOUS:</b>								
Dina, Sask. border	2	10	1	1,700'	14 to 16	Naphthenic ?	Local	1 years
Lloydminster, Sask. border	2	?	nil	1,750' to 1,900'	14	Naphthenic ?	Local	new
Vermilion, near Sask. border	1	?	nil	1,850'	15	Naphthenic ?	Local	new
Del Bonita, Montana border	2	75 ?	nil	5,200'	35 to 37	Intermediate	Local	new
Moose, 30 miles west of Calgary	1	7	nil	1,600'	48	Intermediate		2 years
Taber, S.E. Alberta	1	40 c.	1	3,200'	29	Intermediate		1½ years

NOTES:— a. Prorated to this figure (mean annual).  
 b. 101 wells capable of producing, 83 recently in use.  
 c. Production suspended.

Prepared by F. K. Beach,  
 Petroleum and Natural Gas Division,  
 Department of Lands and Mines,  
 December 31st, 1939.

# ALBERTA OIL PRODUCTION





## CHAPTER II.

## Alberta Oil Development in 1939

The year 1939 established a record in Alberta's oil industry with its production total of 7,594,411 barrels. The number of producing crude oil wells from Turner Valley's limestone totalled 96 by the end of the year as compared with 72 at the end of 1938 and 33 at the end of 1937.

The large increase in numbers of producing wells — 1939 over 1938 — does not of course coincide with the small oil production increase of slightly over three-quarters of a million barrels, which in turn is compared with large year's production increase of nearly four million. It is a result, however, which was more or less expected to happen, in spite of the fact that the new wells of 1939 were in the aggregate just as good performers as those brought in in the previous year.

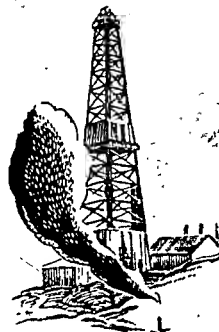
The explanation, which was given in the last review published by this Department in July, 1938, is that the present market for Alberta oil — eastern British Columbia, Alberta, Saskatchewan and a part of Manitoba — was in the process, during 1938, of being supplied for the first time by this Province. Towards the middle and latter part of that year this entire area was being serviced by Alberta for the first time in the history of the Province's oil development. Producing wells at this period, though of a lesser number and subjected to proration as a conservation measure, were not, however, held down to the somewhat drastic limited-production barriers which followed in 1939.

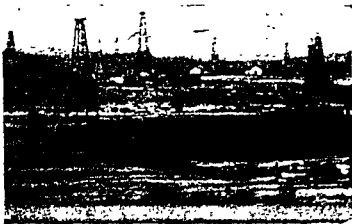
By the end of 1939, Alberta was supplying the same market which the Province had saturated by the close of 1938 without any immediate hope for an extension of its boundaries. The result for 1939, therefore, was an obvious one. If there were to be a small increase in production, such increase must depend entirely upon local conditions affecting supply and demand.

By good fortune, 1939, was blessed with a heavy crop, and harvesting activities demanded increased oil. Had the crop of 1939 been equivalent to that of 1938, Alberta's increased oil production for 1939 would have been reduced from three-quarters to about one-quarter of a million barrels.

Although Alberta has annually yielded commercial production since 1914, and from 1925 has had quite material amounts of "naphtha" from Turner Valley gas wells, it was not until September, 1937, that production began to approach demand for oil within the Province.

In the two and one-third years elapsed since then, a change over from the state of importer to exporter has been accomplished in an orderly manner and the mistakes made in many other flush fields have largely been avoided. Gas





energy needed to bring oil from the producing horizon to the surface has been conserved. The markets have not been flooded with more oil than they could readily absorb, and consequently the price structure has held steady. Contracts for purchase of foreign oil in existence in 1937 were terminated as soon as legally possible and pipe-line

facilities from Turner Valley to Calgary were increased.

In 1939 the British American Oil Company shut down a refinery at Coutts on the International Border which had been using Montana crude and erected one in Calgary. Imperial Oil made important additions to its Calgary refinery, needed to produce gasoline suitable for and in quantity demanded by the market. Gas and Oil Products Company also built a modern cracking plant in Turner Valley. These new refinery facilities have proven that a high octane gasoline can be made from Alberta crude without the need of blending imported stocks. Some imports still enter the province, but exports greatly exceed the imports, and the imports could be cut off without affecting the price structure of crude or of finished gasoline. Exports are largely to the neighbouring Province of Saskatchewan, where two large refineries and a number of small ones use principally Alberta crude.

The Saskatchewan refineries serve that Province and extend their marketing facilities into western Manitoba. Some exports also go to the Northwest Territories where rapid advance in metal mining has created a demand of considerable proportions. During the year a cracking plant was installed at Norman in latitude 65° for manufacture of aviation gasoline from crude produced by the wells in this section of the far north.

The change over from importer to exporter was not made without some growing pains, but effective leadership within the industry and in the Alberta Government succeeded in accomplishing the items above mentioned with a minimum of friction.

In 1938 the Petroleum and Natural Gas Conservation Board was formed and was given a legal standing by the Alberta Government.

A very brief summary of The Oil and Gas Resources Conservation Act, assented to November 22nd, 1938, and by authority of which the Board has since functioned, might be given by simply quoting Clause 3 in Chapter I of the Act, which reads as follows:—

3. The intent, purpose and object of this Act is <sup>Intent, purpose and object of Act.</sup> to effect the conservation of oil resources and gas resources or both in the Province by the control or regulation of the production of oil or gas or both, whether by restriction or prohibition and whether generally or with respect to any specified area or any specified well or wells or by repressuring of any oil field, gas field or oil gas field and, incidentally thereto, providing for the compulsory purchase of any well or wells.

In general, the proration orders of the Board have been accepted by operators who have recognized the fairness of quotas issued. The

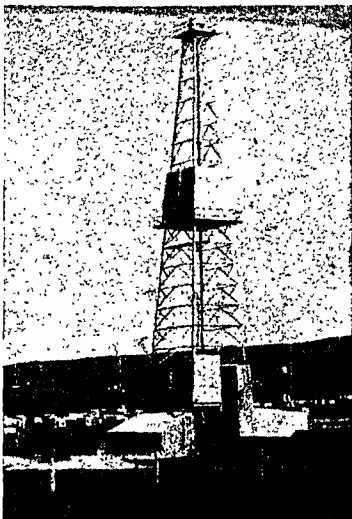
Board has in addition controlled the spacing of wells, confining drilling in Turner Valley to one well per 40 acres. Considering that the average depth of 34 completed oil wells in Turner Valley in 1939 was 7,868 feet, with a cost of \$125,000 to \$150,000 per well, that ruling of the Board has been accepted as a fair one.

The Board also has enforced straight hole drilling, and holes deviating more than 2° from the vertical at any point are unusual, even though the Board's requirements are not so rigorous as a 2° limit. Drilling contractors have discovered that straight hole drilling is less costly than carelessly drilled crooked holes, and completions are now being made in as little as four months. Considering the character of the formations and the inclination of the beds from the horizontal, the completion times are very creditable. It is not so long since 5,000 to 6,000-foot holes in Turner Valley took about a year to drill.

Considerable "wildcatting" has been carried on for years. The province might be divided as an oil prospect into three general divisions: (a) the disturbed belt which roughly parallels the Rocky Mountains, and which has foothills as its topographic expression; (b) the Alberta Geosyncline, a basin or trough lying to the east of the disturbed belt; and (c) the plains area, covering the rest of the province with the exception of a triangle in the north-east corner in which some 9,000 or 10,000 square miles of Precambrian outcrop exists.

The major field now producing is in the disturbed belt, and much attention has been given to this division of the province. Several holes in 1939 gave negative results, faulting having cut off the producing limestone so that it could be reached by the drill only at depths which would be excessive.

Some tests have been made in the geosyncline. There is always the hope for an analogy to the Michigan and Illinois basins. Favourable indications have been found in two such tests but no production as yet. In both the tests referred to, the oil has been of fairly light gravity. It should be noted that nearly 9,000 feet of sediments overlie the limestone in the deepest part of the geosyncline.



In the plains area the depths are not so great and tests are more widely scattered. Several fields have been developed, in most cases the oil being heavy, in fairly thin sands, resulting in small yields per day. Wainwright is the largest field discovered, but there has been no recent drilling for exploitation of the known reserves.

Two wells near Lloydminster and one about 30 miles west discovered oil in 1939, but no estimate of proven area can be made at present. Light gravity oil was encountered near Del Bonita in two wells, but again the proven area cannot be estimated.

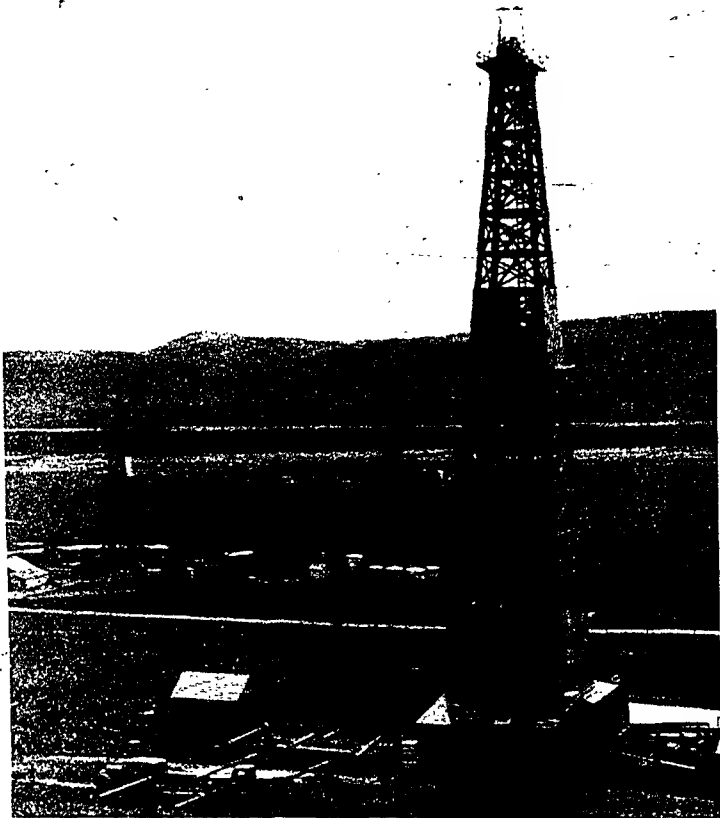
## PROVEN PRODUCING AREAS — OIL.

## TURNER VALLEY.

Distance between extreme north and south ends is about 16 miles. Of this, about  $5\frac{1}{2}$  miles along the structure by a width of about a mile is proven at the south end, and something over two miles along the structure by something less than a mile in width is proven at the north end. Oil production is limited on the east by a gas cap, which in turn ends at a sole fault farther east. On the west, production is limited by salt water which has been encountered in two deep wells, and is being produced in one well in proportions of about 10 per cent of total liquid. Between the two proven areas there have been several wells which have found so little permeability as to make them either non-commercial or border line. The extreme south end of the field appears to have been marked. At the north pool, the dip of the limestone is much steeper than at the south pool, but there may be a wider productive area than at first seemed likely, due to thrust faulting. Neither the northerly nor southerly limits of this pool are marked.

## RED COULEE.

This field was discovered in 1929 and drilling continued in 1930. Most of the productive area proved to be in Montana with only 80 or 100 acres extending into Alberta. Oil is about 30° A.P.I.



**WAINWRIGHT.**

Discovered in 1922, oil has been proven over an area fully 4 miles long by nearly the same distance in width, but the gravity is low ( $18^{\circ}$  to  $22^{\circ}$ ), and yield slow (2 to 25 barrels per day) from thin sands of Lower Cretaceous age—continental deposits that are inclined to lens out. There has been no recent drilling for exploitation of known producing horizons and the wells still pumping are within an area of less than 1,000 acres. Exploitation with modern methods might add greatly to the producing area and quantity produced. Wells in this field show remarkably slow rate of depletion. One well, that had an initial production of 10 barrels a day, after 11 years of steady pumping still yields 9 barrels a day.

**MISCELLANEOUS PRODUCTION.**

Isolated wells have been found in the following localities, in all cases giving indications of probable commercial production, but in none of the cases have proven areas been outlined sufficiently to make a definite statement possible:— Del Bonita; Taber; Skiff—south-east of Lethbridge—1 producer; Dina, near the Saskatchewan border, south-east of Lloydminster; Lloydminster; Vermilion; Bragg Creek.

**PRODUCING AREAS — NATURAL GAS.****MEDICINE HAT-REDCLIFF.**

Producing gas since 1890, some 46 wells still supply the two municipalities with domestic and industrial fuel, forming the basis for manufacturing which includes flour milling, ceramics, glass and greenhouse horticulture. The proven area covers at least 50 square miles, the horizon being a sandy zone in the Upper Colorado.

**BOW ISLAND.**

Bow Island was discovered about 1909 and was connected by pipe-line to Lethbridge and Calgary in 1912, but was quickly depleted. In 1930, when large quantities of gas were being wasted in Turner Valley incidental to recovery of vapour phase oil, the gas company installed compressors and used the pipe-line to carry gas back to the field. Repressuring ceased in February, 1939 after injection of  $13\frac{1}{4}$  million Mcf. The closed pressure was raised from 260 pounds to 565 pounds, and a reserve now exists as a standby in case of interruption to service.

**FOREMOST.**

This field is situated some 20 miles south of the Bow Island-Lethbridge pipe-line. It is a small terrace structure and is valuable as a standby.

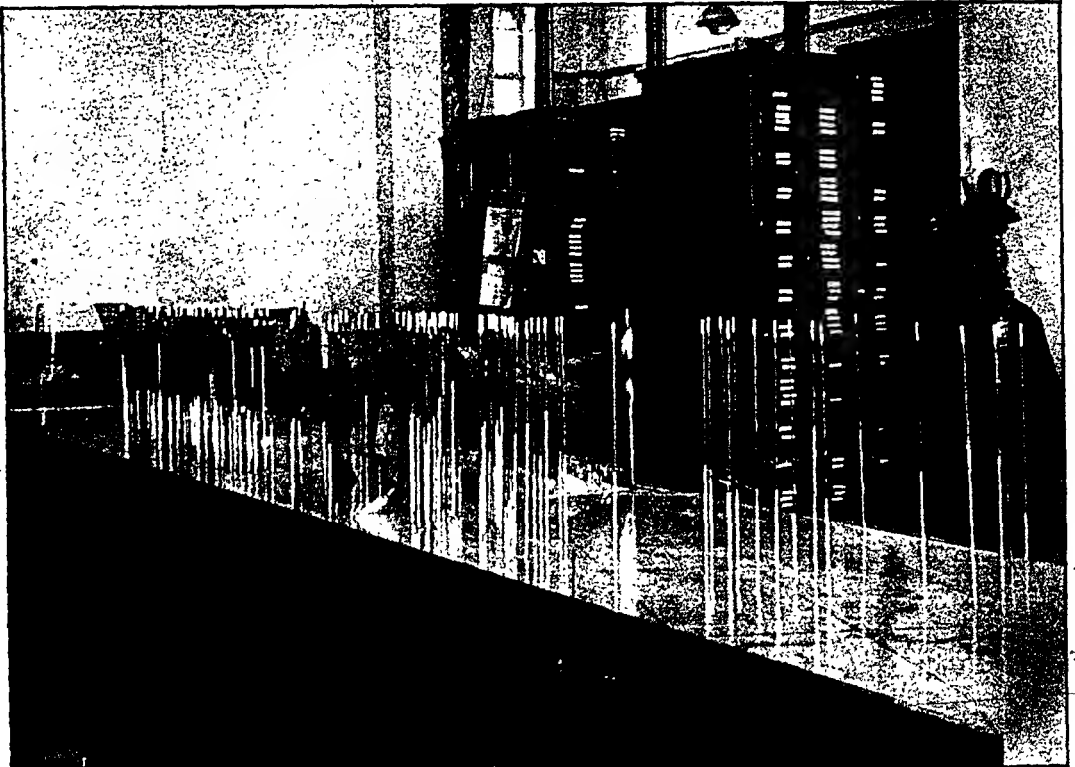
While there are many "farm gas wells," supplying a single user, scattered over the southern part of the province, there seems to be no further proven gas field within easy reach of the Calgary-Lethbridge pipe-line except Turner Valley, Bow Island and Foremost.

**STEVEVILLE.**

Steveville is about 100 miles east of Calgary and large gas flows were obtained in three wells drilled in 1939. Further prospecting is now taking place in this area.

## VIKING AND KINSELLA.

Further north is the Viking field which has supplied Edmonton with gas since 1923, and appears to contain reserves adequate to meet the demand for some years to come. The producing "Viking Sand" is a member of the Alberta (Colorado) shale, some 100 feet above the base of the formation. An area of 15 to 18 square miles has been proven in the Viking field. About 10 miles east, the Kinsella field has been outlined by three wells. The closed pressure is analagous to that initially found in the Viking field, the horizon pro-



PEG MODEL OF TURNER VALLEY FIELD LOOKING SOUTH-WEST.

(For description, see below.)

## PEG MODEL OF TURNER VALLEY FIELD

A peg model of the Turner Valley field, photographs of which accompany this review, is maintained in the geological laboratory, located in the Calgary office of the Division in the New Telephone Building on Sixth Avenue in Calgary.

The base of the model is a map of the field on a scale of  $10\frac{1}{2}$  inches per mile with the pegs or rods which represent the wells accurately located.

In this laboratory formation samples and cores of wells being drilled are examined and by means of various painted colours the formations penetrated in the wells are placed to scale on the pegs or rods.

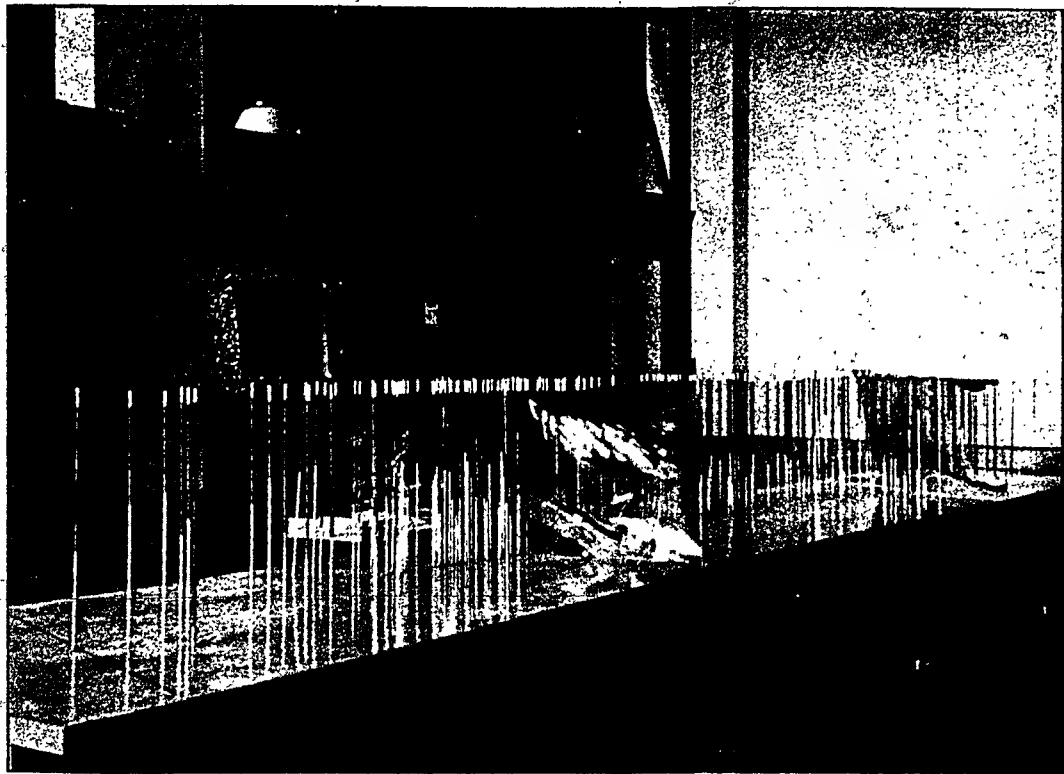
While the various colours do not register in the photographs, the elevation of each well is noticeable, being at the base of the white painted tip of the peg and the limestone contact at the base of the darker coloured paint is also recognizable. The altitude of this horizon is further shown by the small cord leading from well to well.

Two cross sections have been prepared and inserted in the model which illustrate the dips of the formations as found in the individual wells. Another view of the model, looking south-east, is shown on the next page.

ducing gas is the same, and there is good reason to believe that the reserves of gas in Kinsella are much greater than those originally existing at Viking. Kinsella has not yet been drawn on, but it is possible it will be connected up to transmission lines before Viking is entirely depleted.

## NATURAL GAS CONSUMPTION, 1939

	Mcf.
Calgary - Lethbridge system .....	6,266,133
Imperial refinery, Calgary .....	1,265,964
Bow Island town .....	45,149
Turner Valley field demand .....	9,161,220
Edmonton system .....	3,404,550
Wainwright, including estimated field use .....	116,531
Brooks .....	49,019
Medicine Hat - Redcliff .....	2,596,192
Exported to Montana from the Rogers-Imperial well in township 1, range 11, west of the 4th meri- dian, in the Milk River area .....	131,194
Red Coulee field use (including export) .....	33,203
Miscellaneous .....	52,650
<b>TOTAL</b> .....	<b>23,121,805</b>



PEG MODEL OF TURNER VALLEY FIELD LOOKING SOUTH-EAST.

(For description see page 42.)



## CHAPTER III.

## Bituminous Sands of Northern Alberta

The first mention of the vast bituminous sand deposits of northern Alberta was made by Peter Pond in 1788. Five years later they were observed by Sir Alexander Mackenzie.

This far-away period conjures up the names of other great explorers—first pioneers of that immense and wealthy region which was some day to become Alberta—Edward Umfreville, Peter Fidler and David Thompson—names which carry a special significance and which occupy a special place in Canada's history.

The bituminous sands of northern Alberta represent one of Alberta's most valued possessions. The reports of engineers dealing with these vast deposits, their present accessibility, methods of recovery and analyses of products to be obtained, carry a real interest.

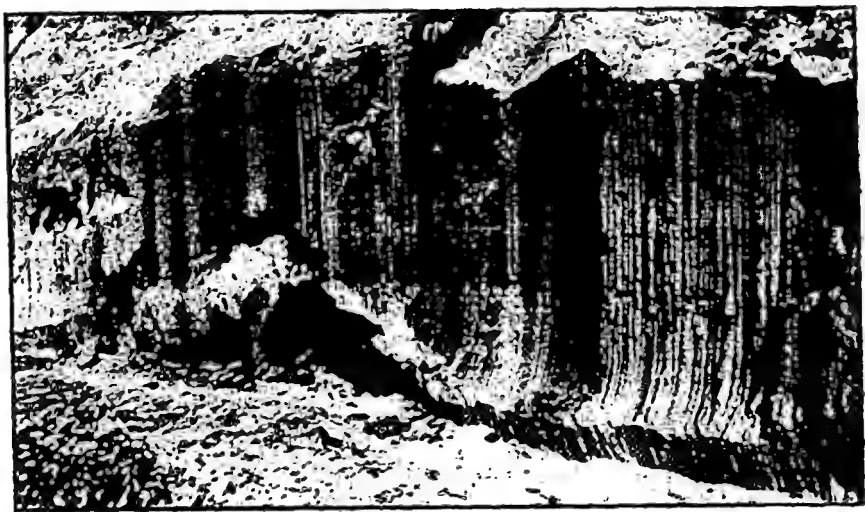
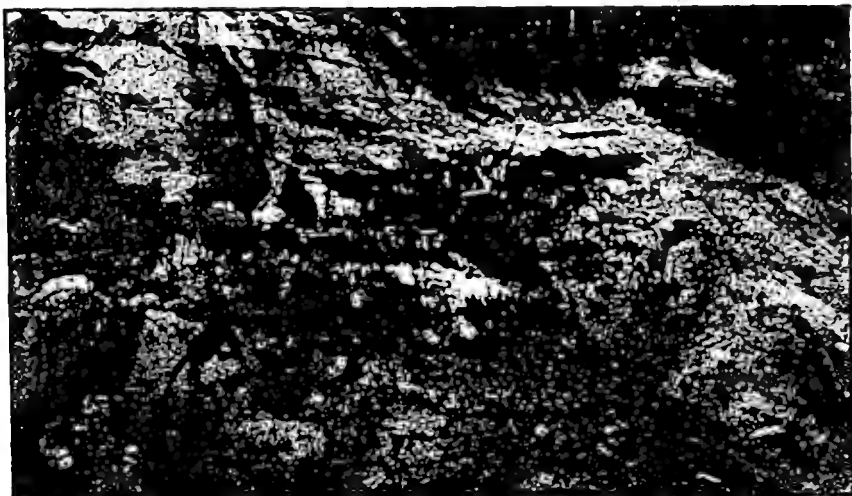
There are many sights of interest for travellers in northern Alberta, the most interesting of all being without question the spectacle of the great cliffs and slopes of these bituminous sands along the banks of the Athabaska River. The exposures, some of which attain a height of 200 feet and more, are noticeable for 100 miles along the river and extend for a considerable distance up its tributary streams.

Fort McMurray represents the focal point for these deposits. From this centre they extend 65 miles down the Athabaska, where they terminate against recent lake deposits, 65 miles or more east up the Clearwater, the eastern limit not yet being mapped and 40 miles south-west up the Athabaska where they pass beneath the river bed. In the vicinity of Pelican Rapids about 80 miles farther south up the Athabaska, wells have penetrated the sands and found them saturated as at the outcrop though apparently much thinner.

A point of interest in connection with the general area is that a line drawn through the Pelican wells to the outermost outcrop circumscribes an area of some 10,000 square miles. If the saturation continues west from the outcrop for 80 miles (the distance from the outcrop to the Pelican wells) the saturated area would cover about 20,000 square miles. In addition to this, should the saturation extend another 20 miles south of Pelican and west from the outcrop more than 80 miles, the area may be increased to 30,000 square miles or even more. It is evident, therefore, that the saturated sands cover an area of at least 10,000 square miles, with the probability of this figure being increased to 20,000 or 30,000.

Out of this vast accumulation of deposit, the area in which the sands are at present accessible for mining is probably less than 20 square miles estimated to contain about one billion barrels of oil.

The bituminous sands, as noticed on the face of the cliffs, are from dark brown to black in colour. Occasional streaks of bitumen can be seen in some sections of the face where small quantities have come to the surface and slowly worked down and the bedding of



BITUMINOUS SAND EXPOSURES, HORSE RIVER, NORTHERN ALBERTA

the formation is noticeable. A strong asphaltic smell emanates from the exposed beds. A distinction presents itself between the beds of richly impregnated sands which stand out in bold cliffs and the lean beds and layers of silt and clay which form gentler slopes.

Where the sand is well impregnated the beds form a very compact material. While the surface can be easily picked into with a sharp pointed tool, a heavy blow makes a remarkably small impression. A lump of the deposit after removal is found to be soft, yielding to pressure and breaking down into a disintegrating mass.

On close inspection the product is shown to be an aggregation of fine sand particles each of which is enveloped by a film of a soft, sticky bitumen. The sand is principally composed of quartz with small quantities of mica and other products.

In the introductory chapter of a report on this area, published in 1926, by Mr. S. C. Ells of the Mines and Geology Branch, Department of Mines and Resources, Ottawa, the following statements are quoted:—

"The three outstanding features presented by a consideration of the bituminous sands of northern Alberta are:—

- (1) That the deposit represents the largest known body of solid asphaltic material.
- (2) That the deposit is, as yet (April, 1925) commercially undeveloped.
- (3) That practically all asphaltic materials used in Canada are imported from foreign countries.

There are three lines along which commercial development of Alberta bituminous sands may be attempted. These are:—

1. Use of the bituminous sand in a more or less crude form as a wearing surface for streets and highways, and as a basis for the manufacture of asphaltic mastic.
2. Various commercial applications of the bitumen when separated from the associated sand aggregate.
3. Destructive distillation of the crude bituminous sand or of partially purified bitumen with recovery of liquid hydrocarbons."

Another quotation of interest under this general heading is made from the report, published in 1929, of Dr. K. A. Clark of the Department of Mining Engineering, University of Alberta, which reads as follows:—

"Few have doubted that the immense deposits of bituminous sand in northern Alberta would eventually, be turned to practical use and form the basis for industry. There has been considerably uncertainty, however, about the form that development would take. Various uses for the material have been recognized as possible. The raw bituminous sand can be used directly for the preparation of pavement aggregates. The bituminous content of the sands can be extracted and used either as an asphalt, principally for road construction of various types or as a crude oil for manufacture of petroleum products. But so long as these uses were all obviously matters of the future, there was little use of considering them in detail. Everything depended on the turn of events in the realm of economics during the period that had to elapse before bituminous sand development became a real possibility.

The general opinion has been that the use of the bituminous sand itself and of the bitumen extracted from it for pavement, and bituminous highway construction would be the use that would first have sufficient practical application to warrant development. Use of the bituminous sand as a source of petroleum products, particularly gasoline, was regarded as a remote pos-



EARLIER OPERATIONS IN REMOVING OVERBURDEN FROM BITUMINOUS SAND, NORTHERN ALBERTA

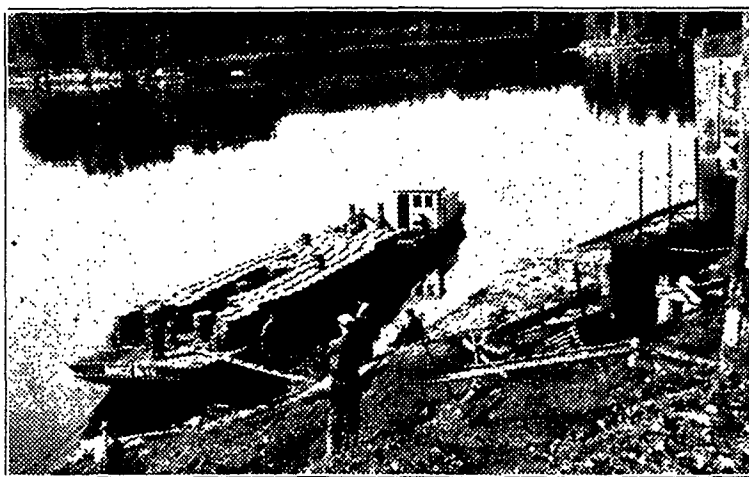
sibility. However, advances of great significance have been taking place in technology of the petroleum industry and have changed the outlook in this latter direction. The conversion of heavy oils into high yields of gasoline is now a matter of every day commercial operations. There is no particular technical obstacle in the way of using the bitumen content of the bituminous sands as a crude oil and this use must be placed along with that of road materials for present consideration. Which offers the best opportunity for commercial development is a matter almost entirely of economics. It is consequently of importance to examine each possible use from this standpoint."

In some of the exposures the saturation is uniform from top to bottom but, generally speaking, the richer beds are at or near the base of the formation. Oil content varies in weight from nothing to 25 per cent with some of the outcrop areas carrying from 100,000 to 125,000 barrels per acre. Others may run even higher.

With reference to the recovered product in its relationship to the sands, it might be stated that on the basis of 250 tons of sand which has been processed, approximately 175 barrels of crude oil is recoverable, from which 43% of high test gasoline, containing a high octane or anti-knock rating, equal or even superior to processed gasoline, to which ethyl liquid has been added for anti-knock properties, is obtained.

The bituminous sands of northern Alberta have been estimated by the Dominion Mines Branch to contain 100,000,000,000 barrels of oil. The United States Bureau of Mines places the figure at 250,000,000,000 barrels. The United States Geological Survey has estimated the proven reserves of oil well fields of the world at 24,465,000,000 barrels.

On the assumption of these official estimates an amazing conclusion is drawn to the effect that the bituminous sands area of northern Alberta contains on the first estimate just given an oil



Loading Oil, Recovered from Bituminous Sand, at International Bitumen Company's Plant, Bitumount, on the Athabaska River, 5 Miles North of McMurray.



REMOVING OVERBURDEN FROM BITUMINOUS SAND AT PLANT OF  
ABASAND OILS, LTD., HORSE RIVER, ALBERTA.



SEPARATION PLANT AND OTHER BUILDINGS OF ABASAND OILS, LTD., ON HORSE RIVER,  
McMURRAY, ALBERTA.

1-1, Separation Plant; 2-2, Power Plant; 3, Warehouse; 4, Office; 5, Pipe Still (under construction); 6, Shell Stills; 7, Condenser Box and Cooler; 8, Pump and Control House; 9-9-9, Tank Farm; 10, Water Pump House; 11-11-11, Area to be Mined; 12, Clay Tower and After-fractionator; 13, Excavator; 14, Horse River.

content which is equivalent to over four times the quantity of the proven reserves of the world's oil fields and on the second estimate to over ten times that quantity.

Mr. Ellis and Dr. Clark, whose statements have been referred to, have over a period of years made extensive studies of these sand exposures, and their published reports, which are given in interesting and elaborate detail, and which contain a wealth of information in maps, topographical sheets, etc., represent a most valuable contribution to scientific research.

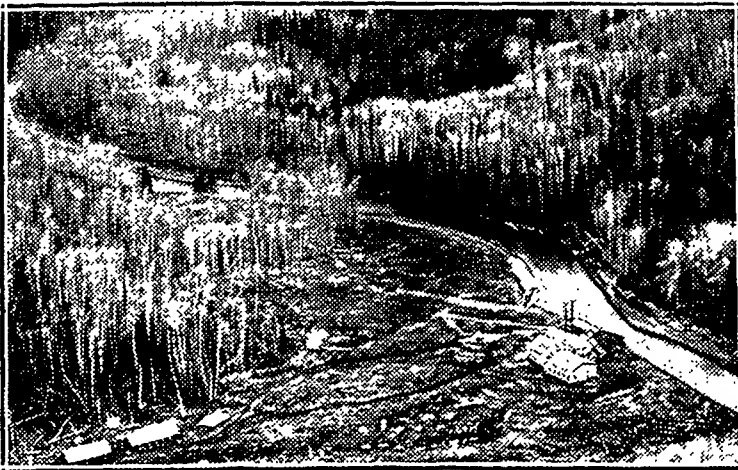
Products offered by the bituminous deposits at Athabaska are gasoline, tractor and Diesel fuels and asphalt. In addition to these are by-products which would be in demand by special markets dealing in roofing, paint, battery-insulations and rubber industries.

A great market awaits the Athabaska bituminous sands development in the matter of paving asphalt and road oil. Alberta alone at the present time has 2,155 miles of gravelled roads for which oil is required, and 20,000 miles of improved roads ready for graveling and, therefore, prospective for oil. The neighbouring Province of Saskatchewan opens up another extensive field in which the demand for this service is greatly felt. In addition to these two provinces the market may be continually enlarged into other areas.

The product is available and the whole question of its development and distribution must of necessity be governed by economic factors as they exist. Should the demand for asphalt diminish, the McMurray development can concentrate on the maximum development of gasoline. As soon as the asphalt markets appear again, the situation can be reversed so as to increase asphalt production and lessen that of gasoline.

To many people who have never visited McMurray there is an extraordinary belief that the town is situated in the Arctic Circle and that winter operations are impossible.

McMurray is 700 miles south of the Arctic Circle and is approximately in the same latitude as the well-known Flin Flon and Sherri-



Gordon mines, at both of which extensive open-pit mining operations are carried on throughout the entire year.

With the exception of stripping of the overburden being impossible in winter all operations in the McMurray bituminous sands development can be carried on throughout the year. Overburden would be hard to move when frozen and a sufficient quantity would be stripped therefore in the open months and processing operations would continue throughout the winter.

Remarkable features about the asphalt produced at McMurray are its ductility-penetration and ductility-softening point ratios, which compare most favourably with asphalt produced in other parts of the world.

Ductility is the distance in which asphalt will stretch without breaking, measured at a certain standard temperature. Penetration is a measure of hardness, the distance that a needle point of a certain size supporting a certain weight will penetrate within a certain time. The smaller the penetration, the harder the asphalt. The softening point is the temperature at which the asphalt begins to soften.

An extract from an article, written by Mr. L. C. Drummond, Secretary-Manager of the Alberta and North-West Chamber of Mines, and published in the December, 1939 issue of "The Pre-Cambrian," is given as follows:—

"The tar sands, or more properly the oil sands, of the McMurray area constitute probably the largest potential oil field in the world, and it has been the dream of many oil technologists to find an efficient and economic process of separating the oil from the sand in such a condition that it will be readily processed in a modern refinery into gasoline, Diesel and fuel oil, and road oils. The engineers of Abasand Oils Ltd., at Fort McMurray, have for some time grappled with the problem and have worked out a treatment which appears efficient and economical. . . . It is expected that trial runs will be made before the end of the year and that the plant will be in full operation early in 1940."

Mr. Drummond makes reference also to the International Bitumen Company, Ltd., whose plant is situated at Bitumont, 51 miles north of Fort McMurray on the Athabaska River. Production of asphalt and fuel oil, the latter used by the operating mining companies of the north, was effected in 1938, demonstrating the possibilities of the oil sands as a source of oil and heavy distillates.

The bituminous sands of northern Alberta contain the largest known deposit of oil in the world and their existence in this region has been realized for a very long time. Since the far-away date of the original discovery they have been a subject of interest and discussion, of skepticism and doubt, of optimism and hope. At last the moment of their development has arrived and the truth as to their possibilities is to be discovered.

With the revelation that on the basis of sound industrial principles they can profitably develop products to compete in quality and quantity with similar products secured from other sources, the bituminous sands of northern Alberta will become a name to vie with the famous deposits of Trinidad. With such a revelation they will become an industry of world-wide importance and a possession concerning which the Province of Alberta will have every reason to be proud.

## CHAPTER IV.

## British Empire Oil Production in 1939

Oil production from the various producing countries of the British Empire showed little change in 1939 in comparison with the preceding year.

The production statement covering the last 8 years, which appears at the close of this chapter, gives a total of 51,281,093 barrels for 1939, as compared with 49,833,661 barrels for 1938, an increase of only 1,447,432 barrels. The 1939 figures are estimations.

Increases and decreases for 1939, as compared with 1938, for the 7 producing countries shown on this statement are as follows:—

NAME OF COUNTRY.	Increases (Barrels)	Decreases (Barrels)
Trinidad	1,527,940	.....
Canada	880,900	.....
Bahrein Island (Persian Gulf)	.....	798,000
Burma	.....	105,500
Brunei (Borneo)	152,790	.....
India	.....	165,200
Sarawak (Borneo)	.....	279,880
	<hr/> 2,861,630	<hr/> 1,348,580
	1,348,580	<hr/>
Increase	<hr/> 1,513,050*	

In the 1938 review Canada was shown bracketed with Bahrein Island and Burma for second place with the odds in favour of these two other countries. The figures for 1939, however, give Canada a definite second place.

In the preceding table it will be seen that Canada not only takes second place in total oil produced, but also second place, in spite of the year's restrictions in proration, by the measure of increased production.

Trinidad, Canada and Brunei are the only three to contribute an increase for 1939. Of the remaining four, the decreases are small with the exception of Bahrein Island, which shows a drop of 798,000 barrels from its production of 1938.

## TRINIDAD.

Trinidad, as will be noted by the yearly statement at the end of this chapter, continues steadily with increases, year by year. The only period which shows a decrease, and it was not a large one, was 1933. The little island off the Venezuelan coast had been for many years not only a dependable source of Empire oil production, but has been famous also for its production of asphalt, recovered from the wealthy deposits which it possesses.

\*Estimated.

## CANADA.

Canada's oil production for 1939 was secured from four sources, as follows:—

	Barrels.
Alberta .....	7,594,411
Ontario .....	207,500*
New Brunswick .....	18,800*
Northwest Territories .....	17,000*
Total .....	<u>7,837,711*</u>

Increases and decreases—1939 as compared with 1938—appear below:—

	Increases (Barrels)	Decreases (Barrels)
Alberta .....	852,372	.....
Ontario .....	34,859*	.....
New Brunswick .....	.....	476*
Northwest Territories .....	.....	5,855*
	<u>887,231*</u>	<u>6,331*</u>
	6,331	
Increase .....	<u>880,900*</u>	

## BAHREIN ISLAND.

Bahrein Island in the Persian Gulf shows rather a heavy decrease in oil production during 1939. This island, which sprang so dramatically into the oil picture in 1936, with very definite increases for 1937 and 1938, met with a set-back in 1939.

This was due largely to the fact that part of Bahrein Petroleum Company's refining capacity was engaged in the processing of the new heavy oil production of Saudi, Arabia.

The island now possesses 62 producing wells with one test which is now drilling. During the year an elaborate system of repressuring was established in the field.

## BRUNEI AND SARAWAK (BORNEO.)

Brunei shared in the four and a half million barrel production increase for 1939 of the Dutch East Indies, which is shown in the world production table appearing in the next chapter. The Brunei and Sarawak totals are included in the general total given for the Dutch East Indies in this statement.

Brunei's contribution to this increase was approximately half a million barrels, but Sarawak, in adjoining territory showed a decrease of slightly over a quarter of a million barrels in comparison with its production total of the preceding year.

## INDIA AND BURMA.

As will be noted in the statement accompanying this chapter, the production from Indian and Burma has been maintained at approximately the same levels for the past eight years.

\*Estimated.

## BRITISH EMPIRE PRODUCTION.

British Empire oil production, in its relationship to world production, has changed little in the last seven years. In 1932 the percentage was 1.80 as compared with 2.48 in 1939.

The responsibility for effecting a definite improvement would seem to rest to a considerable extent with Alberta. As previously stated, with an extension of market boundaries and with a more generous allowable production resulting from such extension, Alberta, in another year's development, through her Turner Valley field alone within its present confines, would be able to challenge the Iraq annual production total.

This in itself will noticeably change the Empire total figure. With further extension to Turner Valley's productive area, together with the bringing in of one or more major fields, the British Empire, through such additional development in the Province of Alberta, will be a definite factor in world oil production.

It is not unduly optimistic to expect that this may happen, and that it may happen in a future not very far removed.

## THE HISTORY OF ALBERTA OIL

## PETROLEUM PRODUCTION IN THE BRITISH EMPIRE, 1932 TO 1939, INCLUSIVE

Country—	1932		1933		1934		1935		1936		1937		1938		1939*	
	Barrels	Per Cent	Barrels	Per Cent	Barrels	Per Cent	Barrels	Per Cent	Barrels	Per Cent	Barrels	Per Cent	Barrels	Per Cent	Barrels	Per Cent
Trinidad	10,126,121	43.1	9,561,353	41.2	10,894,363	41.2	11,671,224	40.7	13,337,080	39.2	15,502,989	36.8	17,737,060	35.5	19,265,000	37.5
Canada	1,044,112	4.4	1,145,333	4.8	1,401,895	5.3	1,447,204	5.0	1,594,287	4.5	2,943,750	7.1	6,956,811	14.0	7,837,711	15.2
Bahrain Island	902	—	31,377	0.1	185,072	1.1	1,264,807	4.4	4,644,735	13.7	7,762,264	18.1	8,298,000	16.7	7,500,000	14.7
Burma	7,073,437	30.1	7,114,311	30.0	7,278,859	27.5	7,181,113	25.1	7,587,718	22.5	7,847,553	18.5	7,499,500	15.0	7,394,000	14.4
Brunei	1,200,026	5.1	2,035,656	8.6	2,705,350	10.2	3,302,905	11.5	3,296,938	9.7	4,397,038	10.5	5,387,210	10.8	5,840,000	11.3
India	1,743,878	7.4	1,628,803	6.9	1,921,823	7.3	2,037,810	7.1	1,978,329	5.8	2,161,653	4.9	2,330,200	4.7	2,165,000	4.3
Sarawak	2,329,733	9.9	2,206,815	9.3	1,942,591	7.4	1,776,593	6.2	1,547,882	4.6	1,655,565	3.8	1,624,880	3.3	1,345,000	2.6
Total British Empire	23,518,509	100.0	23,723,648	100.0	26,429,993	100.0	28,681,656	100.0	33,796,819	100.0	42,270,812	100.0	49,833,661	100.0	51,346,711	100.0
World Total	1,306,714,101	—	1,438,767,449	—	1,517,121,671	—	1,651,993,118	—	1,797,993,578	—	2,046,650,389	—	1,979,248,510	—	2,065,070,440	—
Per Cent, British Empire of World	1.80	—	1.65	—	1.74	—	1.74	—	1.88	—	2.06	—	2.51	—	2.48	—

\*Preliminary figures.

NOTE:—In the total of 7,837,711 barrels shown for Canada in 1939, 7,594,411 barrels or 96.89 per cent were produced in Alberta. The Alberta figure represents the actual production total, the balance of Canada's production being estimated.

## CHAPTER V.

## World Oil Production in 1939

The year 1939 closed with the greatest annual world oil production ever witnessed by mankind since the time when a bountiful Providence first revealed to human beings nature's vast petroleum storehouse.

In this connection it will be of interest to quote the first five paragraphs of an editorial appearing in the international number of "The Oil and Gas Journal," Tulsa, Oklahoma, dated December 28th, 1939, which reads as follows:—

**"THE WORLD'S RECORD.**

Within the year which ends Sunday, the world oil industry has produced 2,065,000,000 bbl. of crude oil, establishing a new record.

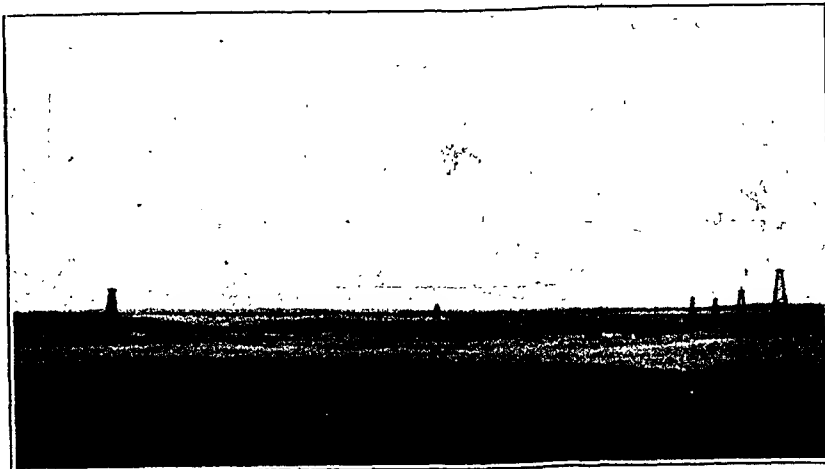
This tremendous production, practically all of which was consumed during the year, represents a 100 per cent gain in the last 15 years, and is four times the output of a little over two decades ago.

In contrast to most industries which still have to look back to 1929 for their peak production and sales, the world oil industry's output this year is nearly 40 per cent greater than it was in that boom year of modern times.

Possibly the significance of this immense production of raw material can be visualized better when it is realized that this year's output, if transported in the 8,000 gal. tank cars of the American railroads, would make a train 78,000 miles long which would encircle the earth at the equator more than three times.

Those outside the oil business have frequently expressed amazement at the industry's ability to continue the expansion of its operations in bad times as well as good times on a worldwide basis."

The international number of "The Oil and Gas Journal," already referred to, contains a most interesting table showing world oil production for 1938 and 1939, which is reproduced herewith:—



RED COULEE WELLS, COUTTS, ALBERTA

# WORLD CRUDE-OIL PRODUCTION BY CONTINENTS AND COUNTRIES

(Figures represent barrels)

Country—	1939	1938	Daily average	
	Estimated		1939	1938
North America:				
Canada.....	8,053,000	6,956,230	22,063	19,058
Mexico.....	41,700,000	38,506,000	114,247	105,496
United States.....	1,248,544,000	1,200,883,000	3,420,670	3,290,000
Total North America.....	1,298,297,000	1,246,345,230	3,556,980	3,414,554
Per cent of total .....	62.87	62.97		
South America:				
Argentina.....	18,377,500	17,077,600	50,349	46,788
Bolivia.....	191,600	135,400	525	371
Colombia.....	22,998,000	21,660,720	63,008	59,344
Ecuador.....	2,265,000	2,249,740	6,206	6,164
Peru.....	12,974,210	15,838,610	35,546	43,516
Venezuela.....	209,875,000	190,231,780	575,000	521,183
Total South America.....	266,681,310	247,193,850	730,634	677,366
Per cent of total .....	12.91	12.48		
British West Indies:				
Trinidad.....	19,265,000	17,737,060	52,780	48,595
Per cent of total .....	.93	.89		
Europe:				
Albania.....	921,650	437,600	2,525	1,199
France.....	553,230	532,180	1,516	1,458
Germany.....	5,875,000	4,259,720	16,096	11,670
Hungary.....	1,100,000	324,850	3,014	890
Italy.....	91,250	106,100	223	291
Poland†.....	3,350,000	3,730,000	9,165	10,219
Rumania.....	46,565,000	48,984,200	127,575	134,203
U.S.S.R.†.....	219,700,000	214,714,000	601,918	588,257
Total Europe.....	278,156,130	273,088,650	762,032	748,187
Per cent of total .....	13.47	13.79		
Africa:				
Egypt.....	5,100,000	1,660,000	13,971	4,548
Per cent of total .....	.24	.08		
Asia:				
Bahrein.....	7,500,000	8,298,000	20,548	22,734
British India§.....	9,750,000	9,829,700	26,712	26,931
Dutch East Indies¶.....	66,791,000	62,240,870	182,986	170,523
Iran (Persia).....	77,000,000	77,230,000	210,959	211,589
Iraq.....	29,500,000	32,400,000	80,822	88,767
Japan (including Taiwan).....	2,375,000	2,500,000	6,507	6,850
Saudi Arabia.....	4,300,000	495,150	11,780	1,357
Total Asia.....	197,216,000	192,993,720	540,314	528,751
Per cent of total .....	9.55	9.75		
Others.....	355,000	250,000	970	685
Per cent of total .....	.017	.012		
Grand total.....	2,065,070,440	1,979,268,510	5,657,681	5,422,650

\*The German production figure now includes about 2,040 bbls. daily production from Austria and 330 bbls. daily from Slovakia and Moravia and 3 months' output of the Reich's part of Poland.

†Figure for 1939 covers only 9 months. Last 3 months included in U.S.S.R. and Germany.

‡Includes Sakhalin and 3 months' production from the U.S.S.R. portion of Poland.

§Burma included with British India.

¶Includes Sarawak and Brunei, which had combined total of 6,370,000 bbls. production during the year.

It may be noticed that the estimated 1939 production, appearing in this table for Canada—8,053,000—differs by 215,289 barrels from the estimate of 7,837,711, published by this Department. The difference, however, in relationship to the world total, is of course negligible.

#### WORLD INCREASES AND DECREASES.

Increases of the principal oil producing countries of the world for 1939—the figures being given approximately in millions—are as follows:— Canada, 1; Mexico, 3; U.S.A., 48; Argentina, 1; Columbia, 1; Venezuela, 19; Trinidad, 2; Europe, 5; Egypt, 3; Arabia, 4; Dutch East Indies, 4. These are offset by the following decreases: Peru, 3; Bahrein Island, 1; Iraq, 3.

The United States and Venezuela show the largest increases, but it should be stated that Egypt and Arabia provided the most spectacular surprises of the year—particularly Arabia. In 1939 the estimated Arabian oil production is given at 4,300,000 barrels. In 1938 the total was only 495,150 and prior to that date no production was recorded in that country at all.

#### EGYPT.

Egypt jumped from 1,660,000 barrels in 1938 to 5,100,000 in 1939. From 1938 back to 1934 little change is shown in annual totals. The 1939 increase came almost exclusively from the new Ras Gharib field in the neighbourhood of Suez.

#### UNITED STATES.

The United States as in former years registered in 1939 the greatest production of all, an amount equivalent to 62 per cent of the world's total. Though showing approximately a 4 per cent increase over 1938, the total did not, however, reach that of the record year of 1937—2,046,543,000 barrels.

#### VENEZUELA.

In the accompanying world chart, Venezuela appears as the third greatest oil producing country of the world, with Russia taking second place. Information regarding the latter country is extremely difficult to obtain, however, and there is reason to believe that if the actual figures could be revealed Venezuela would be shown as having passed the U.S.S.R. in the latter part of 1939. The outstanding Venezuelan developments last year, responsible for her large increase in production, took place in the eastern part of that country.

#### IRAQ.

Iraq's decreased oil production for 1939 was caused by the fact that normal tanker movements were interrupted during the final quarter of the year.

#### GERMANY.

In the foot-notes at the bottom of the world production chart the information is given that the production total for Germany includes, in addition to actual German production, the production of Austria, Slovakia, Moravia and three months' output of the Reich's part of Poland. Russia's total includes three months' output of the Russian portion of Poland. Poland's total represents only the first 9 months of 1939.

The 1938 oil review, published by this Department, quoted the statement of a recognized authority, in speaking of synthetic gasoline production, to the effect that such processing was "uneconomical and incapable of swift expansion."

Germany, to carry on her part in the war, must have more oil than she is at present able to secure. However uneconomic the production of synthetic gasoline may be, this country has raised such production from 2,072,000 barrels in 1933 to 11,900,000 barrels in 1938. Her crude oil production during the latter year totalled 4,396,000, which added to the total of synthetic production gives a grand total of 16,296,000 barrels for 1938. Germany's war-time needs, however, are estimated at 143,500,000 barrels annually. The various estimates which have been made as to her petroleum storage for war-time requirements do not reach very high figures. Where is her oil to come from?

With the difficulty of obtaining reliable information, no estimate of her synthetic oil production for 1939 is given. Whatever may be its total it cannot possibly be sufficient to come up to her present war-time oil requirements. An estimate of 5,875,000 barrels for her 1939 crude oil production is made and that includes 2,040 barrels per day from Austria—approximately 734,400 barrels for the year—with contributions from Slovakia, Moravia and three months' output from the Reich's part of Poland.

Without a doubt the Nazi eyes are on Rumania. Rumania, however, has in recent years experienced a reduced output from her oil-fields, production having dropped from 63,655,000 barrels in 1936 to an estimated 46,565,000 in 1939. In addition to this, it is necessary to remember that 80% of Rumania's oil industry is foreign owned—chiefly by Great Britain, France and the United States. Only by Rumania levying quotas—for the benefit of Germany—on the British and French Rumanian companies, could the Reich hope to secure relief from that quarter. Such action would, of course, be in defiance of the Allies' warning. The situation is a critical one, and its settlement should furnish an interesting chapter in the history of the present war.

The possibility of Germany securing oil requirements in large quantities from Russia is a remote one. In order to do so it would be necessary to overcome and settle a whole series of problems, not the least of which is the marked decline in Soviet oil exports during the past few years.

Finally, to look for any real relief by the measure of increased production of synthetic gasoline would appear to be hopeless. About five tons of lignite are required for recovery of one ton of gasoline, and to secure a million tons of gasoline (approximately 7,000,000 barrels) would take an average of 5,250,000 tons of lignite, which in turn would necessitate the employment of 22,750 skilled miners.

Motor fuel, recovered by the synthetic process in sufficient quantities to enable Germany to carry on the war, would call for the services of about 500,000 skilled miners, with an additional 250,000 skilled labourers for work in the hydrogenation factories, to say nothing of the vast quantities of lignite which would have to be mined for processing. To reach such colossal figures and to finance operations on so gigantic a scale, particularly with the country in a state of war, would, according to general opinion, be utterly impossible.

## CHAPTER VI.

## Conclusion

The history of Alberta's oil and gas development has been given at some length in the opening chapter of this review, but the subject has, nevertheless, only been partly covered. If space permitted, much additional information could be given which would deal with the early exploration and development of oil and gas resources in different parts of the province.

The history goes back a long way—back to the days of George M. Dawson and Dr. Bell of the Dominion Government Geological Survey over 60 years ago. It goes back even further—to that period at the close of the eighteenth century in which there appeared such national figures as Alexander Mackenzie, David Thompson, Peter Fidler and others, as mentioned by Dr. J. A. Allan, Professor of Geology, University of Alberta, in his "Future Mineral Development in Alberta."

Oil occurrences were noticed in the Great Northwest by these earliest of explorers and a volume of many pages could be written if all the adventures and experiences from that time on could be collected together for presentation in chronological order.

For the successful maintenance and advancement of Alberta's oil industry certain factors are necessary.

One is the continued conservation of the oil and gas resources of the province by means of orderly development, so that wastage and loss of sub-surface pressures may be eliminated and the life of producing fields safeguarded from danger.

Another is the maintenance of a price structure that will be adequate to assure continued production of oil. It should be noted that crude oil from Turner Valley now yields the producer about .07c for each gallon of gasoline turned out or about .031½c for each gallon of crude oil.

The Government has sponsored a judicial enquiry into oil which has covered quite a lengthy period of time. The report of this enquiry has not yet been tabled, but it might be stated that the general intention for holding this investigation was to find out whether both the producer and the consumer were being fairly treated.

Alberta produced a record year in 1939 with her total oil production of 7,594,411 barrels. It is well to remember, however, that this figure, without any danger to the Turner Valley field, could have been a considerably larger one if a wider market had been established to absorb the additional product which could have been available. The subject of market expansion represents another necessary factor upon which the permanence of the industry's advancement depends. It is just as important as those which have already been mentioned.

The Government of Alberta has given this side of the question a great deal of thought and has made every endeavour to alleviate the situation.

Market extension is an immediate necessity if the industry is to be successfully continued and to progress. Such extension must, to be of any value, be secured on the basis of economic transportation to more distant markets and without endangering in any way the price structure which has previously been so steadily maintained.

A solution would be arrived at by an adjustment of freight rates—for the present. Later, when production, regulated by conservation, shall have sufficiently increased to warrant it, the promotion of pipe-line construction may have to be considered,—the cost of such an undertaking to be redeemed on an amortization plan covering a period of years.

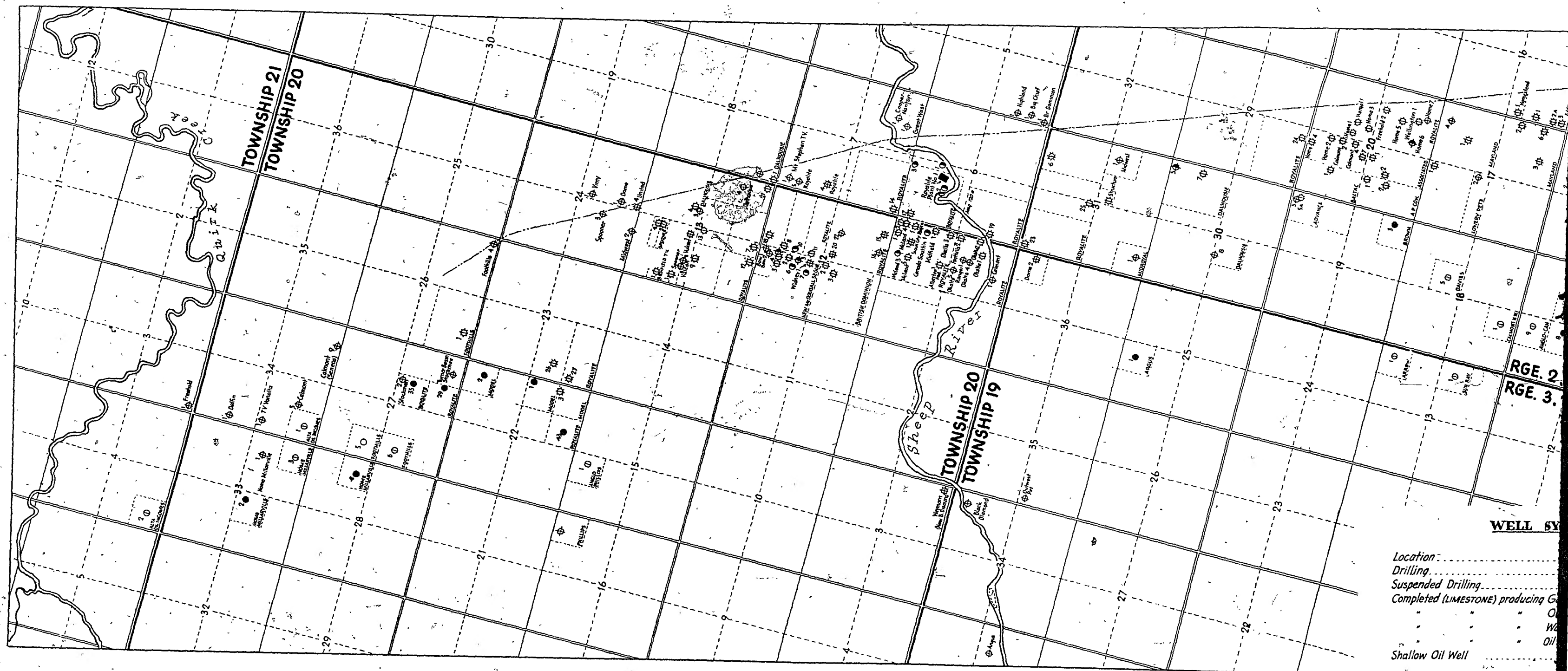
This is a very important question indeed. It is one which may demand a definite solution in the immediate future so that development and exploration may be satisfactorily continued.

The annual review on Alberta's oil development is published this year at greater length than usual. This is due to many reasons, such as for instance, the noticeable advance made by the industry, the present critical period of the world's history, and the increased and widespread interest now being shown in growing development. It is hoped that the material offered herewith may serve as a reference book and answer, perhaps, some of the questions which are now being asked.

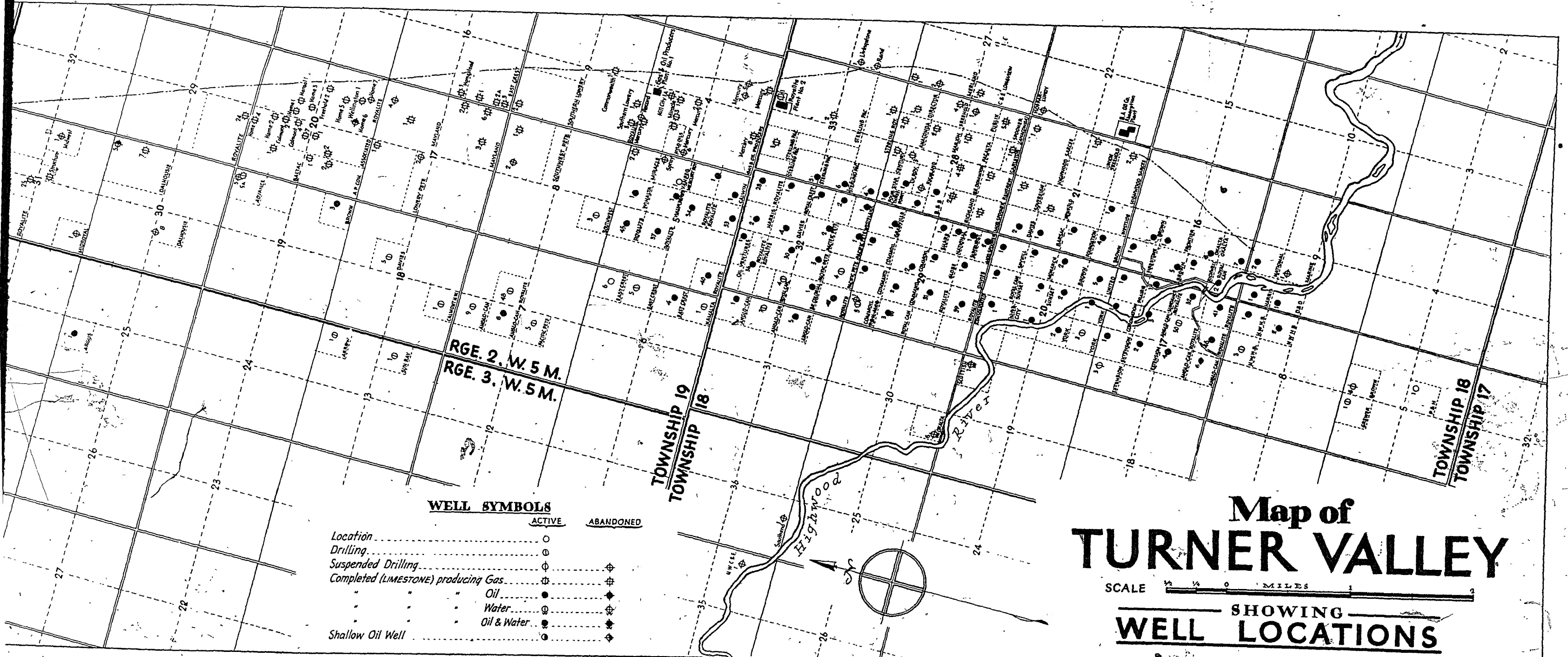
Applications for "Schedule of Wells Drilled for Oil and Gas to 1938," with the 1939 supplement, giving a brief but detailed record of individual wells drilled at different times throughout the province, should be addressed to the Superintendent, Mining Lands Division, Department of Lands and Mines, Edmonton, Alberta. Enquiries respecting regulations governing the leasing of petroleum and natural gas rights, the property of the Crown, should be sent to the same address. With regard to regulations as to drilling and operation of wells, enquiries should be sent to the Petroleum and Natural Gas Conservation Board, New Telephone Building, Calgary, Alberta.

Additional information dealing with the subject of Alberta's oil development will at any time be gladly forwarded on receipt of application to the Department.





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**WELL SYMBOLS**

	ACTIVE	ABANDONED
Location	○	○
Drilling	⊙	⊙
Suspended Drilling	⊕	⊕
Completed (LIMESTONE) producing Gas	⊗	⊗
Oil	●	●
Water	⊖	⊖
Oil & Water	⊗	⊗
Shallow Oil Well	○	○

**Map of  
TURNER VALLEY**

SCALE 0 1 2 MILES

**SHOWING  
WELL LOCATIONS**